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[OFFICIAL NOTICE.]

Twenty-Seventh Annual Meeting, Western Gas Association.

OFFICE OF SECRETARY,
NEW ALBANY, IND., April 25th, 1904.

The Twenty-seventh Annual Meeting of the Western Gas Association, in connection with the Gas Congress of all American Gas Associations, will be held at the Gas Exhibit Department of the Louisiana Purchase Exposition, St. Louis, Mo., June 14 to 18, 1904.

The sessions of the Western Association will be held June 14th, and will be called to order by the President, Mr. F. H. Shelton, at 10 A.M.

The Gas Congress of all American Associations will be held at the same place, Wednesday and Thursday, June 15-16; Mr. Rollin Norris, President of the American Gas Light Association, presiding at the opening session.

The various passenger associations have refused to grant the usual rates on the certificate plan, for the reason that all railroads have agreed to furnish rates to persons attending the St. Louis Exposition at a less rate than obtainable heretofore by the certificate plan.

A consultation with the passenger agents in the various localities will secure rates to St. Louis, with the privilege and restrictions imposed by the different rates obtainable.

The Hotel Jefferson will be the Association's headquarters, and Mr. E. G. Cowdery, Chairman of the Committee on Arrangements, announces that "The Committee will be represented at all times, in this location, by efficient help, to be of assistance to delegates in any way they can."

The Committee of Arrangements announce rates at the various Hotels as follows:

Hotel Jefferson: $7 to $12 per day for room; privilege given for two persons to occupy a room.

Planters' Hotel: $3 per day per person; European plan. The hotel will place four persons to a room.

St. Nicholas Hotel: $7 per day and upward per room; European plan. Two persons privileged to occupy a room.

St. James Hotel: $7 per day per room, with privilege of two to four persons to each room.

The "Inside Inn," located upon the Fair Grounds, offers the following rates:

European Plan Includes Lodging and Daily Admissions.	Number of Rooms.	American Plan Includes Lodging and Daily Admissions.
$1.50 a day.....	500	.....$3.00 a day.
2.00 "	500	..... 3.50 "
2.50 "	500	..... 4.00 "
3.50 to 5.50 a day....	500 with bath	....$5.00 to 7.00 "

Children under 10, half rate.

Single meals: Breakfast, 50 cents; luncheon, 50 cents; evening dinner, 75 cents. A la carte service at moderate prices.

Persons desiring to join the Association will have application blanks mailed to them upon application to the Secretary.

JAMES W. DUNBAR, Sec'y.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF EDITOR, WRINKLE DEPARTMENT,
CLEVELAND, O., April 5, 1904.

This department is now open and ready for contributions, which will be presented at the Twenty-seventh Annual Meeting, to be held next June in St. Louis, Mo.

The active co-operation of all members and friends is earnestly solicited. Please forward contributions to the Editor at once.

W. E. STEINWEDELL, Editor.

BRIEFLY TOLD.

THE MICHIGAN GAS ASSOCIATION AND THE GAS CONGRESS.—Mr. S. E. Wolf, President of the Michigan Gas Association, has mailed the following notice to the members: "The Michigan Gas Association has allied itself to the Gas Congress, to be held in June, under the auspices of the Western Gas Association, at the Louisiana Purchase Exposition. It is desired that all members attending that Congress go as delegates of this body."

MAYOR MCCLELLAN ON THE REMSEN GAS BILL.—Mayor McClellan, in his usual manly fashion, after due public hearing and prolonged personal consideration of the measure recently passed by the New York Legislature, known as the "Remsen Gas Bill," which in full effect merely permits the Consolidated Gas Company, of New York city, to hook up its new plant at Astoria, L. I., with its existing plant at Ravenswood, L. I., gave the following reasons for affixing his signature to the measure:

"Before this measure came into my hands I shared the opinion of many persons that it was in some way contrary to public interests, but after hearing argument for and against it, and carefully examining its provisions, I am convinced that this opinion was unwarranted. It was suggested on the argument that there might be concealed in the bill some danger to the city's rights, but no one pointed out such a danger, and I have been unable to find ground for the suspicion. More specific and substantial objection, therefore, must be advanced to justify rejection of the bill.

"It has been urged that the measure is improper because it makes no provision for compensation to the city as a consideration for my approval of it, but this suggestion presupposed that it confers upon the Company rights or privileges which it does not now possess. This I find is not the case, and the bill has no other purpose or effect than to confirm rights which were validly conferred by the Legislatures of 1871 and 1892. Since the city yields nothing, no payment may be justly exacted for my approval.

"Nor does it offend against the theory of home rule that the Legislature, instead of the local authorities, has acted in the matter. The rights were created originally by the Legislature, and the Legislature is the only power which can confirm them.

"However opinions may differ as to the wisdom of granting the rights conveyed in 1871 and 1892, they are now vested, and I find no reason to disagree with the opinions of the Corporation Counsel and the eminent legal experts, John E. Parsons, James C. Carter and Wheeler H. Peckham, that this is but a confirmation of the rights, nor can I discern that the effect of the measure is more extensive than its language discloses.

"Under these conditions the city parts with no interest by this bill, but it is promised that in the event of its becoming a law the manufacture of gas will gradually be discontinued in Manhattan, and the several plants now operated here transferred to Queens. Apart from removing a serious menace to the public health in several congested centers of population, such action would leave many extensive pieces of land which could be acquired for needed public improvement, or devoted to wholesome dwellings now so much in demand.

"A somewhat similar bill was passed last year, but failed of approval by my predecessor, primarily because it attempted to confer on the Company electrical franchises not a part of the original rights; but the present measure expressly removes such an objection by declaring that no electrical franchises are by this section conferred upon the said Company.

"The bill retains the provision which requires annually the payment to the city of 3 per cent. of its gross receipts in the territory formerly comprised in Long Island City.

"I cannot see how I can do otherwise than approve this bill. The opposition to the bill, it seems to me, is based upon a misapprehension as to the facts. While such opposition is a most wholesome and desirable thing, evidencing, as it does, a jealous care for the welfare of the local community, it must, of course, be limited to statements of fact where an infringement of the rights of the local community is threatened."

NOTES—

THE hearing on the petition of the Pittsfield (Mass.) Coal Gas Company, to the Board of Gas and Electric Light Commissioners, for the right to increase its capital stock in the sum of $60,000, will be held on the 6th inst.

THE Portland (Ore.) Gas Company has arranged for the placing of 30 miles of mains this season.

ACCORDING to the report of the United Gas Improvement Company, submitted some days ago to Controller Walton, of Philadelphia, respecting the Company's sales of gas in that city for the quarter ended March 31, tne output amounted to 1,888,589,820 cubic feet. The output for the corresponding quarter in 1903 was about 18,000,000 feet more than that reported for 1904.

THE Common Council, of Norwich, Conn., has named Judge J. M. Thayer, William F. Bogue and John McWilliams as the commission to arrange for the taking over, for operation on municipal account, of the plants of the Norwich Gas and Electric Company.

[REVISED BY THE SECRETARY.—Continued from page 648.]

TWENTIETH ANNUAL MEETING, OHIO GAS LIGHT ASSOCIATION.

HELD IN THE HOLLENDEN HOTEL, CLEVELAND, O., MARCH 16, 17 AND 18, 1904.

SECOND DAY—MARCH 17.—MORNING SESSION.

The Association reconvened pursuant to motion for adjournment, at 9:30 A.M., of March 17th. The President introduced Mr. M. E. Malone, of Denver, Col., who read the following paper on

BURNING COKE BREEZE WITH UNDERFEED STOKERS.

The utilization of coke breeze as fuel is a subject which has been given a great deal of thought, and many experiments have been made to ascertain some practical method by which it can be successfully used for this purpose. It is only within a recent period that any real success has been obtained in using coke breeze for fuel purposes, but when we consider that all coke delivered to the yard, by the time it is crushed, screened, handled and ready for the market, produces from 10 to 15 per cent. of breeze, which contains from 75 to 80 per cent. of carbon, it is self-evident that we have a valuable fuel residual which has been heretofore regarded as almost useless.

There are two methods employed for burning breeze in furnaces under boilers that have met with more or less success: 1st, underfeed mechanical stokers; 2d, forced or induced draft attachments to furnace, in connection with some form of specially adapted grate bars. The following report shows results of tests in Denver with each of the above methods:

DENVER, COL., January 29th, 1904.

Mr. M. E. Malone, Supt. Gas Department.—Dear Sir: Some time ago we completed the installation of a simple forced draft arrangement for the burning of breeze at our West Side electric station, as follows:

Selecting two batteries of two 160-horse power B. & W. boilers per battery, having a 3-foot alleyway between batteries, which were giving rather poor service, due perhaps to poor draft from short individual stacks per battery, we placed an 18-inch riveted pipe about 6 feet long, closed at one end and open at other end, to a No. 9 Sturtevant blower, in said alley, parallel to grate bars with center of pipe some 10 inches below bottom of grate bars, and with closed end of pipe just even with end of grate at bridge wall of boiler, thus placing the delivery pipe, so-to-speak, just opposite the grate bars but below same. This pipe was furthermore made with 6 openings, 3 on a side, provided with nipples, draft gates, and lastly, with nipples and flanges. We then passed three 5-inch wrought iron pipes capped at one end directly through the side wall and center wall, equally spaced from bridge wall to dead plate, and allowed capped end to rest in last side wall, the other ends being connected by companion flanges to flanges of nipples at 18-inch pipe as provided. These pipes passed transversely, and some 3½ inches below the grate bars, the same being done for opposite battery, the three 5-inch pipes being fastened to nipples of 18-inch pipe diametrically opposite those of first battery. Thus it will be seen that both batteries or the 4 boilers were hooked up to 1 blower and so arranged as to run one or both batteries.

The 5-inch blast pipes are perforated with 2 double rows of $\frac{9}{16}$-inch holes at 2-inch centers, and staggered, allowing 2½ inches between sets of rows, holes in sufficient number to equal discharge volume of 5-inch pipe, taking into account friction, contracted orifice, etc. These pipes are so placed that one set or double row of holes is turned directly down, the other facing up at an angle of 45°, which seemingly gives a good distribution of air. The blower, running at 1,500 r.p.m., is belt-driven from 15-horse power motor, delivering about .59-inch water pressure in 18-inch dipe, and when up to speed using a little less than above power for all boilers.

Owing to the present inconvenience and limited time, we have not been able to provide for an evaporation test with this arrangement, but within a short time will have completed arrangements for accurate tests. Under the circumstances, I attempted an approximate comparison with breeze and Baldwin slack coal as fuel, using the two boilers of one battery, giving us the same draft conditions, etc., as follows:

Filled both boilers with water so as to register 8½ inches on gauge glasses, marking height on glasses, then closed tightly the supply valve at each boiler. Then fired one boiler with a weighed amount of breeze and fired the other with a weighed amount of Baldwin coal, noting the time at the beginning and end of test, the end of test being taken when water in gauge stood at exact bottom of glass, or when exactly 8½ inches of water were evaporated as shown by gauge. The results and data of this test follow: A, boiler fired with breeze; B, boiler fired with coal.

	A.	B.
Fuel weighed to boiler, pounds	702	691
Fuel weighed back at end of test	105	50
Fuel weighed actually burned	597	641
Time to evap. 8½ ins. water on gauge, min.	40	30
Amount of fuel burned per min., pounds.	14.9	21.3
Inches water on gauge evap. per minute.	.213	.283
Inches water per minute per pound of fuel	.0143	.0132
Per cent. gain in favor of breeze	7.6	....
Rate of burning per sq. ft. grate per hr., lbs.	29.8	42.6

The rate of combustion gives data which would need more study to give better and more accurate comparisons. The draft at blower—.59 inches and in stacks about .30 inches. The fires needed no cleaning, being free from clinkers, and the air distribution was good, no holes in fires.

The second test consisted of timing the evaporation of same amount of water as before by burning a weighed amount of the mixture of breeze and Baldwin coal in 1 to 1 proportion. The data and results follow: A, boiler fired with breeze; B, boiler fired with mixture.

	A.	B.
Fuel weighed to boiler, pounds	702	792
Fuel weighed back, pounds	105	85
Fuel actually burned, pounds	797	707
Time to evap. 8½ ins. water on gauge, minutes	40	40
Per cent. gain in favor of breeze	12.7	....
Rate of combustion per sq. ft., grate per hour, lbs.	29.8	35.2

Encouraged by these rough tests, and finding that by trial we could burn breeze in the new 500-horse power Heinie boilers, which have an excellent draft, we decided we would attempt holding the steam pressure for our day load at this station with the following success:

We fired, with breeze only, the 4 B. & W. boilers, with forced draft, also the two 500-horse power Heinie boilers, together with two 200-horse power Heinie boilers fired with lump coal, having a third 200-horse power Heinie banked and ready for use. This made a total of some 1,640 rated boiler horse power fired with straight breeze and 400 boiler horse power fired with coal. Under this arrangement we held the station load (some 3,000-horse power) until 10:30 A.M., when the load increased somewhat and it was necessary to clean fires, when we found it necessary to mix a little U. P. lignite slack coal with the breeze for an hour or two to increase the capacity evaporation, and then again fired straight breeze as before until evening load came on with a change of firemen, who are not as yet acquainted with the method of handling breeze, so that we fired coal in the large boilers, not using the breeze boilers unless peak load demands.

In summation, wish to state that we are at present firing the six boilers with breeze during the day with good success, burning between 18 and 20 tons of same per day. In firing breeze straight we find no clinkers whatever. It needs a little more handling and light firing, while in firing the mixture, and particularly when mixed with moist coal, we find considerable clinkering and much more work in handling fires.

In conclusion I wish to state that a similar arrangement of forced draft is being completed on two 50-horse power Kewanee tubular boilers at the gas works. When completed this will offer better facilities for accurate evaporation tests than we are at present able to make, and I hope within 10 days to be able to present more accurate results and furnish data which will present the breeze proportion further in detail, from which we can then work up or know the commercial value of this seemingly useless product. Therefore, kindly consider these results as roughly approximate, but from observations and from what study I have been able so far to give to the subject, as highly encouraging.

Yours very truly, H. R. WEBER.

February 20th, 1904.

Having completed the forced draft arrangement at gas works, I take pleasure in presenting this supplementary report, as promised in my communication of January 29, 1904.

The following results are those obtained from evaporative tests made at the Seventh street gas works, using as fuel breeze and a mixture of one to one of breeze and Northern slack coal, as burned with underfeed stoker, and burned under a special forced arrangement, giving comparative values of the different fuels, and the capacity and efficiencies of the boilers under the two different boiler equipments as installed at these works:

DIMENSIONS AND PROPORTIONS.—Kewanee tubular boiler, rated at 50-horse power. Grate surface 4 feet 6 inches wide by 5 feet long, 22.5 square feet; water heating surface, diameter of shell 48 inches, 16 feet long; 48 flues 3 inches diameter, 16 feet long; 704 square feet.

Tabulated Results.—Test No. 1, February 8, 1904. Made on underfeed stoker burning breeze.

Duration of tests	5 hours
Steam pressure boiler, average	90 pounds
Average temperature of feed water entering injector	56 degrees
Average temperature of feed water leaving injector	152 "
Average temperature of chimney gases	500 "
Force draft at delivery pipe of stoker	3½ inches
Force of draft in throat of boiler	.30 "
Quality of steam:	
Pounds water evaporated	7,004.0
Pounds water evaporated corrected for injector	7,634.4
Pounds "breeze" burned, as fired	1,319.0
Pounds ashes and clinkers	310.0
Per cent. refuse to "breeze"	23.5
Pounds water evaporated to 1 pound breeze, actual	5.77
Equiv. evap. from and at 212° to 1 pound breeze	6.31
Equiv. evap. from and at 212° to 1 pound comb.	8.26
Breeze burned per stoker, per hour	263.8
Pounds water evap. per sq. ft. heating surface per hr.	2.16
Horse power developed	48.4
Rated horse power	50.0
Below rating, per cent.	3.2
Efficiency, Parr Calorimeter:	
Calorific value of dry breeze per pound	10,658 B.T.U.
Calorific value of combustible	13,045 B.T.U.
Efficiency of boiler (based on combustible)	61 per cent.
Eff. of boiler inc. grate, etc., (based on dry breeze)	57 per cent.
Horse power per hour, by engine running stoker	2.0
H. P. per hr. by motor running blast for stoker	1.5
Per cent of power used by motor and stoker	7.2
Analysis of breeze:	
Moisture	2.3 per cent.
Carbon	77.6 "
Ash	20.1 "
Flue gas analysis:	
CO_2	4.2 "
O	16.6 "
CO	None

Test No. 2.—February 9, 1904.—Made on underfeed stoker, burning breeze:

Duration of tests	5 hours
Steam pressure boiler, average	88 pounds
Average temperature of feed water entering injector	57 degrees
Average temperature of feed water leaving injector	154 "
Average temperature of chimney gases	500 "
Force of draft in breeching	.30 inches
Quality of steam:	
Pounds water evaporated	5,189.0
Pounds water evaporated, corrected for injector	5,656.0
Pounds of breeze as fired	1,030.0
Pounds of ashes and clinkers	238.0
Per cent. refuse to breeze	23.1
Pounds water evaporated to 1 pound breeze, actual	5.49
Equivalent evaporation from and at 212° to 1 lb. breeze.	6.01
Equivalent evaporation from and at 212° to 1 lb. comb.	7.82
Breeze burned per stoker per hour	206.0
Pounds water evap. per sq. ft. heating surf. per hr.	1.6
Horse power developed	35.9
Per cent. refuse to breeze	23.1
Efficiencies:	
Of boiler, based on combustible	57.0
Of boiler, including grate, etc., based on dry breeze	54.0
Per cent. of power used by motor and stoker	10.0
Flue gas analysis:	
CO_2, 5.6 per cent.; O, 15.1 per cent.; CO	None
CO_2, 7.2 per cent.; O, 13.6 per cent.; CO	"

Test No. 3.—February 18, 1904.—On underfeed stoker, burning breeze and coal, 1 to 1:

Duration of test	4 hours
Steam pressure boiler, average	88.0
Average temperature of feed water entering injector	57.0
Average temperature of feed water leaving injector	153.0
Average temperature of chimney gases	550.0
Force of draft in breeching	.30 ins.
Quality of steam:	
Pounds of water evaporated	8,823.0
Pounds of water evaporated, corrected for injector	9,617.0
Pounds of fuel as fired	1,684.0
Pounds of refuse; clinkers, 191; ashes, 53	244.0
Per cent. of refuse to fuel	17.5
Pounds of water evaporated to 1 pound of fuel, actual.	5.71
Equiv. of water evap. from and at 212° to 1 lb. fuel	6.27
Equiv. of water evap. from and at 212° to 1 lb. comb.	7.33
Fuel burned per stoker, per hour	421
Pounds of water evap. per sq. ft. heating surface per hr.	3.41
Horse power developed	76.0
Increase over rating, per cent	52.0
Efficiencies:	
Of boiler, based on combustible	64.0
Of boiler, including grate, etc., based on fuel	58.0
Per cent. of power used by motor and stoker	4.6
Flue gas analysis:	
CO_2, 5.2 per cent.; O, 15.2 per cent.; CO	None
CO_2, 7.1 per cent.; O, 13.3 per cent.; CO	"

Analysis of ash:	
Unburned carbon	26.6 per cent.
Ash	73.4 "

Test No. 4.—February 16, 1904.—On flat grates, with small draft tubes out, giving ash pit draft, burning breeze:

Duration of test	4 hours
Steam pressure, boiler, average	91.0
Average temperature of feed water entering injector	57.0
Average temperature of feed water leaving injector	154.0
Average temperature of chimney gases	380.0
Force of draft at bridge wall	3.0 ins.
Force of draft in breeching	.25 "
Quality of steam:	
Pounds of water evaporated	4,521.0
Pounds of water evaporated, corrected for injector	4,928.0
Pounds of breeze, as fired	1,000.0
Pounds of refuse; clinkers, 95; ashes, 260	355.0
Per cent. of refuse to breeze	35.0
Pounds water evaporated to 1 pound breeze, actual	4.92
Equiv. water evap. from and at 212° to 1 pound breeze	5.39
Equiv. water evap. from and at 212° to 1 pound comb.	8.37
Breeze burned per hour	250.0
Breeze burned per square foot grate surface per hour	11.1
Pounds water evap. per sq. ft. heating surface per hour	1.75
Horse power developed	39.1
Below rating, per cent.	21.8
Efficiencies:	
Calorific value of breeze per pound	10,658 B.T.U.
Calorific value of combustible	13,045 "
Of boiler, based on combustible	62.0
Of boiler, including grate, based on breeze	48.0
Horse power per hour on motor running blast	1.25
Per cent. of power used by motor	3.2
Flue gas analysis:	
CO_2, 5.8 per cent.; O, 14.7 per cent.; CO	None
CO_2, 3.4 per cent.; O, 17.4 per cent.; CO	None

Test No. 5.—February 17, 1904.—Of flat grates, with draft tubes in, holes turned up, slots in pipes turned down, burning breeze:

Duration of test	3 hours
Steam pressure boiler, average	92.0
Average temperature of feed water to boiler	156.0
Average temperature of chimney gases	420.0
Force of draft at bridge wall	3.5 ins.
Force of draft in breeching	.30 "
Quality of steam:	
Pounds of water evaporated	3,939.0
Pounds of water evaporated. corrected for injector	4,294.0
Pounds of breeze as fired	1,000.0
Pounds of refuse; clinkers, 88; ashes, 225	313.0
Per cent. of refuse to breeze	31.0
Pounds of water evaporated to 1 pound breeze, actual.	4.29
Equiv. water evap. from and at 212° to 1 pound breeze	4.70
Equiv. water evap. from and at 212° to 1 pound comb.	6.86
Pounds breeze burned per hour	333.0
Pounds breeze burned per sq. ft. grate surface per hour	14.3
Pounds water evap. per sq. ft. heating surface per hour	2.03
Horse power developed	45.5
Below rating, per cent.	9.0
Efficiencies:	
Of boiler, based on combustible	50.0
Of boiler, including grate, based on breeze	42.0
Per cent. of power used for motor	3.2
Flue gas analysis:	
CO_2, 3.4 per cent.; O, 17.0 per cent.; CO	None
Analysis of ash:	
Unburned carbon	34.4 per cent.
Ash	65.6 "

Test No. 6.—February 17, 1904.—On flat grate, forced draft arrangement complete: Burning mixture of breeze and Northern slack coal, 1 to 1:

Duration of test	3 hours
Steam pressure boiler, average	90.0
Average temperature of boiler feed water	156.0
Average temperature of chimney gas	450.0
Force of draft	.30 inches
Quality of steam:	
Pounds of water evaporated	5,295.0
Pounds of water evap. corrected for injector	5,772.0
Pounds of fuel as fired	1,100.0
Pounds of refuse; clinkers, 50; ash, 113	163.0
Per cent. of refuse to fuel	14.8
Pounds of water evaporated to 1 pound of fuel, actual.	5.24
Equiv. water evap. from and at 212° to 1 pound fuel	5.74
Equiv. water evap. from and at 212° to 1 pound comb.	7.55
Fuel burned per hour	366.0
Fuel burned per hour per square foot grate surface	16.2
Pounds water evap. per hr. per sq. ft. heating surface	2.73
Horse power developed	61.0
Above rating, per cent.	22.0
Efficiencies:	
Of boiler, based on combustible	61.0
Of boiler, including grate, based on fuel	53.0
Per cent. of power used by motor for blast	3.2
Fuel gas analysis:	
CO_2, 6.0 per cent.; O, 14.1 per cent.; CO	None
Analysis of refuse:	
Unburned carbon	47.8 per cent.
Ash	52.2 "

Test No. 7.—February 18, 1904.—On flat grates, forced draft arrangement, burning Northern lignite slack coal:

Duration of test	2 hours
Steam pressure boiler, average	91.0
Average temperature of feed water	156.0
Average temperature of chimney gases	480.0
Force of draft	.30 ins.
Quality of steam:	
Pounds of water evaporated	4,397.0
Pounds of water evaporated corrected for injector	4,793.0
Pounds of coal as fired	900.0
Pounds of refuse	65.0
Per cent. of refuse to coal	7.2
Pounds of water evaporated to 1 pound coal, actual	5.32
Equiv. water evap. from and at 212° to 1 pound coal	5.83
Equiv. water evap. from and at 212° to 1 pound comb.	6.29
Fuel burned per hour	450.0
Fuel burned per hour per sq. ft. of grate surface	20.0
Water evap. per hr. per sq. ft. of heating surface	3.2
Horse power developed	76.0
Above rating, per cent.	52.0
Efficiencies:	
Calorific value of coal per pound	10,174.0
Calorific value of combustible	10,746.0
Of boiler, based on combustible	36.6
Of boiler, including grate, etc., based on coal	55.3
Per cent. of power for motor driving blast	3.2
Analysis of coal:	
Moisture	12.01 per cent.
Volatile	35.19 "
Carbon	46.24 "
Ash	6.56 "
Flue gas analysis:	
CO_2, 4.0 per cent ; O, 16.5 per cent.; CO	None

Test No. 8.—February 6, 1904.—Made at West Side electric station on 500-horse power Heinie boiler, under natural induced draft, burning breeze:

Duration of test	2 hours
Absolute steam pressure	137.0
Average temperature of feed water	193.0
Average temperature of chimney gases	413.0
Force of draft	.65
Quality of steam:	
Pounds of water evaporated	15,803.0
Pounds of breeze fired	3,500.0
Pounds of refuse	....
Per cent. of refuse to breeze	....
Pounds of water evaporated to 1 pound breeze, actual.	4.50
Equiv. evap. from and at 212° to 1 pound breeze	4.78
Equiv. evap. from and at 212° to 1 pound comb	....
Breeze burned per hour	1,750.0
Breeze burned per hour per square foot grate surface	24.8
Water evap. per hour per square foot heating surface	1.77
Horse power developed	302.0
Per cent below rating	39.0
Efficiency:	
Of boiler, based on combustible	....
Of boiler including grate, based on breeze	43.5
Flue gas analysis:	
CO_2, 6.2 per cent.; O, 12.6 per cent.; CO	None
Analysis of breeze:	
Moisture	4.6 per cent.
Carbon	68.2 "
Ash	27.2 "
Calorific value of Parr calorimeter	10,658
Analysis of clinker:	
Unburned carbon	31.8 per cent.
Ash	68.2 "
Total carbon wasted	8.64 "
Total breeze wasted	5.89 "
Analysis of ash:	
Unburned carbon	27.0 "
Ash	73.0 "
Total carbon wasted	7.34 "
Total breeze wasted	5.0 "

Comparative Summary.

1. Burning breeze on underfeed stoker.
2. Burning breeze on underfeed stoker, second test, made while adjoining boiler in battery was cold.
3. Burning mixture of breeze and slack coal on stoker.
4. Burning breeze on Sheffield flat grates, hand firing under forced draft, admitting air to closed ashpit through pipe in bridge wall only.
5. Burning breeze on Sheffield flat grates, hand firing under special forced draft arrangement complete, with draft tubes under grates, holes in said tubes turned up.
6. Burning mixture of breeze and coal on Sheffield flat grates, hand firing under forced draft, as in No. 5.

7. Burning lignite slack coal on Sheffield flat grates, as in No. 6.
8. Burning breeze on Sheffield grates, with ¼-inch mesh, hand firing, under natural induced draft.

collecting tube reaching to the center of the stack being used to take the samples, which were siphoned out by water in the collecting tube and sampling cans. The samples of flue gas showed great over-ventilation

	No. 1.	No. 2.	No 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
Steam pressure boiler gauge, pounds	90	88	88	91	92	90	91	137.
Force of draft in stack, in.	.30	.30	.30	.25	.30	.30	.30	.65
Water evaporation per hour, pounds	1,527	1,131	2,404	1,232	1,431	1,924	2,396	7,901
Fuel burned per hour, pounds	264	206	421	250	333	366	450	1,750
Per cent. refuse	23.5	23.1	17.5	35.	31.	14.8	7.2	....
Water evaporation per pound fuel, actual pounds	5.77	5.49	5.71	4.92	4.29	5.24	5.32	4.50
Equivalent evaporation from 212° per pound fuel, pounds	6.31	6.01	6.27	5.39	4.70	5.74	5.83	4.78
Equivalent evaporation from 212° per pound comb., pounds	8.26	7.82	7.33	8.37	6.86	7.55	6.29	....
Builders' rated horse power, per cent	50.	50.	50.	50.	50.	50.	50.	500.
Horse power developed, per cent	48.5	35.9	76.	39.	45.5	61.	76.	302.
Per cent. of rated horse power developed, per cent	97.	72.	152.	78.	91.	120.	132.	60.
Fuel burned per square foot grate surface per hour pounds	....	....	....	11.1	14.3	16.2	20.	24.8
Water evaporated per square foot heating surface per hour pounds	2.16	1.6	3.41	1.75	2.03	2.73	3.2	1.77
Efficiency of boiler (based on comb.) per cent	61.	57.	64.	62.	50.	61.	56.	....
Efficiency of boiler and grate (based on fuel)	57.	54.	58.	48.	42.	53.	55.	43.5
Per cent. of power used by installation	7.2	10.	4.6	3.2	3.2	3.2	....	....
Cost of evaporation:								
Cost of fuel per ton of 2,000 pounds in boiler room	2.31	2.42	2.33	2.68	2.98	2.54	2.50	2.88
Cost of power for evap. 1,000 pounds water under observed conditions	.073	.0985	.0461	.0451	.0389	.0288	.0232	....
Cost of fuel for evap. 1,000 pounds water under observed conditions	.201	.220	.203	.272	.347	.241	.235	.319
Cost of power and fuel for evap. 1,000 pounds water from and at 212°	.254	.298	.230	.292	.353	.248	.236	.300
Cost of power and fuel for evaporating 1,000 pounds water from and at 212° and cost of maintenance	.274	.325	.243	.295	.355	.250	.237	....
Cost of apparatus and installation		$700.00				$275.00		
Cost of maintenance, repairs per year		200.00				10.00		
Depreciation, 10 per cent per year		70.00				27.50		

The President—This very interesting paper, with reference to the utilization of a waste product, at least in some gas plants, is now open for discussion.

Mr. Malone—As the paper by Mr. C. H. Williams, of Madison, Wis., is on practically the same general subject, I would suggest that it be read at this time, so that the papers may be discussed jointly.

The President—As Mr. Williams is not present this morning, I will call on Mr. Olds to read the paper which bears the title,

BURNING COKE BREEZE ON HOLLOW GRATES.

Mr. H. L. Olds read Mr. Williams' paper, as follows:

The following test, carried out at the gas plant of the Madison Gas and Electric Company, was made to determine the value of coke breeze as boiler fuel.

The boiler on which the test was made was an 18-foot by 72-inch horizontal cylindrical tubular, fitted with a patent grate bar made especially for handling coke breeze.

The fuel is hand-fired, and a forced draft is furnished by a No. 5 Sturtevant volume blower, which has the following capacity:

Pressure at fan outlet,	½	oz.;	speed,	878;	volume of air,	1,490	cu. ft.
"	"	"	1	"	"	1,015;	"	"	1,725
"	"	"	1½	"	"	1,240;	"	"	2,110
"	"	"	2	"	"	1,140;	"	"	2,450

The blower delivers its air to a system of hollow grate bars, from which it is fed under the fuel bed at a practically uniform rate. The run was made under ordinary running conditions, and no effort was made to obtain any different results than those obtained in our everyday practice. The fuel was carefully weighed in iron barrows as it was brought into the firing floor, and the ashes weighed back. The water was weighed by means of a system of two tanks on scales, which emptied into a third, from which the feed pump suction was taken, and at the same time a check was made upon the hot water meter which is used to check the daily results obtained.

The coke breeze was then taken from the crusher as it was working on coke which had been taken from the top of the coke pile, and was a fair sample of the breeze ordinarily obtained. A cubic foot of this breeze was placed in a box and weighed, after having carefully weighed the box. The box and contents were then placed on top of the water gas generating apparatus, in a good, hot place, and allowed to stand for 10 days, when the box and contents were again carefully weighed. It was found that the weight of the breeze alone had shrunk 15 per cent., due to contained water being evaporated.

Frequent weighing was made during the 10 days, and at the end of the period the weight had become practically constant, as most of the free water had been driven off. The usual precautions, as to conditions of fire, height of water at the beginning and ending of the test, were made and recorded, and proper corrections made where necessary.

The samples of flue gases were taken at the bottom of the stack, and about 2 feet above the top of the boiler setting, a long water jacketed of the furnace, too much air being sent through the fuel bed by the blower.

MADISON GAS AND ELECTRIC COMPANY.—Log of boiler test at gas works, January 19th, 1904. Length of test, 13 hours.

Dimensions:		
Water heating surface		1,670
Grate surface, square foot		30
Ratio of heating to grate surface		55.6
Pressures:		
Steam gauge		81.6 pounds
Steam gauge, absolute		96.3 "
Steam pressure (calorimeter, absolute)		14.75 "
Temperatures:		
Escaping gases (from pyrometer)		524.3
Feed H_2O from lake		37 degrees
Feed H_2O entering boiler		111.88
Fuel:		
Total breeze		9,153 pounds
Per cent. moisture		15 per cent.
Dry breeze		7,795 pounds
Total refuse		2,660 "
Total combustible		5,135 "
Average combustion per hour:		
Total coke breeze		750 pounds
Total breeze, dry		611.5 "
Total combustible		394 "
Total combustible per square foot grate surface		13.1 "
Total dry breeze per square foot grate surface		20.38
Total dry breeze per square foot heating surface		.466
Total combustible per square foot heating surface		.307
Flue gases:		
CO_2		6.1 per cent.
CO		.3 "
O		12.4 "
Quality of steam		98.3
Total water:		
Total pumped		40,257
Total evaporated		39,600
Factor of evaporation		1.1417
Equivalent from and at 212°		45,200
Water—average per hour:		
Pumped, pounds		3,100
Evaporated, dry steam, pounds		3,040
Equivalent from and at 212°, pounds		3,480
Economic evaporation:		
Per pound fuel		4.33
Per pound dry breeze		4.975
Per pound combustible		7.73
Equivalent from and at 212°, fuel		4.94
Equivalent from and at 212°, dry breeze		5.69
Equivalent from and at 212°, combustible		8.84
Evaporation per hour:		
Per square foot grate surface, from feed H_2O temp.		101.7
Per square foot grate surface, equivalent at 212°		116.0
Per square foot heating surface, actual		1.82
Per square foot heating surface at 212°		2.08
Horse power—On a basis of 34.5 pounds equivalent evaporation per horse power per boiler:		
Horse-power		101

Efficiency of boiler:

B.T.U. utilized per pound combustible.. } per cwt.....		60.5
" per pound combustible..... }		

Power to operate blower = 104.5 kw. hours.

There was no discussion on the papers, and on motion, votes of thanks were tendered to Messrs. Malone and Williams for their interesting contributions.

The President—The next paper for consideration is on

THE CONSTRUCTION AND OPERATION OF RECUPERATIVE BENCHES—No. 2,

by Mr. W. A. Baehr, of St. Louis, Mo. This is a paper following the one prepared and published in our last year's Proceedings. As Mr. Baehr is unable to be present with us to-day, although we expected him here, I will ask Mr. Paul Doty to read the paper.

Mr. Doty read as follows:

When I wrote my paper on the same subject as above, for the meeting of the Ohio Gas Light Association during March, 1903, it was with the intention of continuing the same line of reasoning followed in that paper, only extending the same to finer scientific methods, for the discussion I intended to present this year. Unfortunately for that intention, I was transferred to St. Louis soon after the March meeting, 1903, and the duties of my position have taken up so much of my spare time that until very recently I was forced to suspend those interesting heat studies to which my previous paper serves as an introduction.

The short interval from the time of the resumption of those studies until now has been too limited to work out such a paper as I desire to present, and, therefore, I will confine this discussion to a few of the practical and important considerations of the materials of bench construction. I will add that it was only the most earnest solicitation of our Secretary, Mr. Jones, that caused me to consent to write my views this year. It is my intention to present certain lines of reasoning regarding the quality of fireclay products used in bench construction in as forceful a manner as possible, simply because it seems we are away behind the times on this subject. We are using all kinds of these products in enormous quantities every year, and most of these goods are of such inferior quality that we, as gas men, ought to be ashamed that we permit such construction.

Among the rare but shining examples of good bench construction, we can point to the new retort houses in Milwaukee, Wis., and Lowell, Mass., and for linings for water gas sets of unusual excellence Chicago would surprise all except those acquainted with the Gas Company's plants in that city. Now I am referring to the workmanship and to the quality of the fireclay products at these places, and not to points relating to design, and I think the engineers who are responsible for these excellent structures deserve the highest praise. The whole matter was most forcibly brought to my attention last fall. We installed a number of large water gas sets, and it is certainly rather disgraceful to be obliged to record that the linings of all of them will have to be renewed this spring. Six months' life for a carburetter lining is indeed a poor showing.

As is well known, St. Louis has some of the largest and most important firebrick manufactories in the United States, and its clays are said to be equal to any in the world for this purpose. In order to get at the matter in a comparative way, I procured samples of tile made in Stettin, Germany, from Mr. West, in England, and from all the St. Louis manufacturers. Thereupon the matter was taken up with all the local firms in this line and the result will be, of course, that we will secure vastly better material.

I wish to state right here that there is absolutely no desire on my part to injure a manufacturer or to advertise another, but these remarks simply emanate from a strong desire to see the gas engineering profession lifted to a higher plane of scientific principles. What gas engineer can witness the progress in modern machine tools, in electrical engineering, in gas engine engineering, in any branch of science, without being filled with the hope of similar advancements in his own line? Progress, and rapid progress at that, is the spirit of the times, and those who fall behind imperil their own interests.

In justice to the manufacturers I will state that, after an interview with them, the impression prevails that the gas companies are themselves largely to blame for the present state of affairs. Bids for retorts, benches and shell linings have been requested, and the lowest bidder, generally, irrespective of quality of goods, received the order. This, of course, led to keen competition, low prices, and the inevitable deterioration of quality. This is all wrong. To secure quality, we must pay a sufficient price, and it is right to give the order to the lowest bidder *only when his goods are strictly up to specifications and requirements.* For instance, who would buy a modern lathe, electric transformer, watch or any machine simply because it was the cheapest offered?

The requirements to be filled by fireclay products for gas manufacture are as follows:

1. The material must be capable of withstanding the highest heats which can be employed in gas making, without melting down. There is no question but that all gas making processes should be run at the highest heats, and, therefore, this requirement is imperative.
2. The material must be such as to be able to readily withstand transportation and handling.
3. The material must have great resistivity against mechanical action, such as the friction of rakes, pokers, etc.
4. The material must have a coefficient of expansion that is practically nil.
5. The material must have a structure as nearly as possible *perfectly indifferent* to frequent and extensive changes of temperature.
6. The material must not readily fuse with clinkers in the fire beds.
7. The material must present the proper physical characteristics of strength, smoothness, hardness and fineness.
8. The material must be furnished practically exact as to size.

In conversation with a number of manufacturers, I have been informed that the chemical composition is not so important as one would at first suppose. They say that one clay from one part of the country would serve a certain purpose very nicely, whereas a clay of the same composition from another part might fail entirely. This may have been the case, but the fact remains, chemical composition is very important. An instance was cited where a Pittsburg glass company imported a German fireclay man of great repute abroad, but who failed utterly to secure results with American clays, although he used chemical compositions similar to those obtaining in Europe.

It is, of course, pre-eminently true that the physical treatment of the clays, proper ageing, proper mixtures, etc., constitute extremely important portions of the success or failure of a product. For instance, it seems to me that none of the manufacturers so far have used sufficient pressure to make retorts dense enough to exclude air and transmit the heat with the greatest degree of efficiency. I say retorts should be made by machinery, although the hand process is largely used here and also abroad. It is merely a question of getting the *correct* machine.

Now I do not wish to argue over points of manufacture at present, but believe a table showing the composition of a few *notably good firebrick* products will be interesting, mainly because they differ so much, and yet all are excellent goods.

Per Cent. by Weight of.	Samples From— Christy Fireclay Co., St. Louis.	Stettin, Germany.	Mr. West, England.
SiO_2	63.98	59.060	86.310
Al_2O_3	30.63	38.020	8.535
Fe_2O_3	3.13	Trace	0.815
CaO	0.51	0.410	0.500
MgO	Trace	0.097	0.116
K_2O	0.54	0.646	0.336
Na_2O	1.43	1.316	1.093
Total	100.33	99.839	98.294

The West brick is an acid brick, almost infusible. Some people claim a brick should be an alkali for certain purposes, but it is difficult to determine. Do not understand me to say that only one quality of brick should be used in a structure. It has recently come to my notice that the Carborundum Company, of Niagara Falls, New York, markets carborundum grain or powder, which, when mixed with silicate of soda to the consistency of a thick paste, can be spread on firebrick about $\frac{1}{16}$-inch thick, and is said to form a splendid heat resisting and strong surface. We may be able to properly use such a device over cheap brick, but at present I will recommend the following general points when asking for bids on benches, furnace linings, etc.

1. Specify that a certain quality of material shall compose each portion of the structure. If the manufacturers cannot show bricks of the same kind they propose to furnish, already in use and giving known good results, then request them to have satisfactory tests made, or withdraw from the competition.
2. Have it thoroughly understood that quality is demanded first and price second.
3. Have it thoroughly understood that each piece of material delivered shall be subject to rigid inspection by a competent man, and if not satisfactory *in every particular*, it will be rejected.
4. Insist upon workmanship being of the best, and also subject to competent inspection.
5. Take a live interest in getting first-class material yourself, and note the result.
6. Finally, do not buy of a certain manufacturer just because your grandfather in the gas business *invariably* bought of him. There are others in the field. Stimulate the competition for producing *better material*, and the manufacturers will soon take pride in their results. Remember, the best is none too good.

It would be unwise on my part were I to attempt to say just how each manufacturer should produce his goods. Therefore I will leave the question with the foregoing comments, and sincerely trust that all gas men will make an honest effort to break away from "Cheap John" lines, so that we can better our results and keep pace with the rapid advance of modern progress.

I wish to add that certain manufacturers have kindly furnished me notes on fireclay products. Not wishing to incorporate them in this body of my paper, but being desirous of adding them to the stock of gas literature, they are herewith appended by permission of the gentlemen at the head of their respective firms. The papers are as follows:

1. A letter from Mr. Lemon Parker to Mr. D. R. Russell, dated January 20, 1904.
2. A paper read before the National Brick Manufacturers Association in 1901, by Mr. Lemon Parker, with discussion by Mr. Stowe.
3. Notes on refractory material for gas benches, by Mr. R. H. Miller, of the Christy Fireclay Company, St. Louis, dated January 25, 1904.
4. Notes by Mr. C. C. Hartung, of the Christy Fireclay Company, dated January, 1904.
5. Notes by Mr. George C. F. Vater, of the Christy Fireclay Company, dated January, 1904.
6. A letter from Mr. John Dell, of the Missouri Firebrick Company, dated January 11, 1904.
7. A letter from Mr. J. L. Green, of the Laclede Firebrick Manufacturing Company, dated January 20, 1904.

MR. D. R. RUSSELL, Addressed. [COPY.] January 20th, 1904.

Dear Sir: Replying to your request for data for paper of Mr. W. A. Baehr, this is a very difficult and complicated subject and the field is so large that it is very hard to cover entirely. Beginning at the mine, clay which is for use under high heats has to be selected carefully by the miner before it is placed upon the car, as it varies largely in different locations in the same mine; also, there is a great difference in chemical analysis of a clay found at the bottom, middle and upper section of a seam. I have noticed that there is a great difference in the shrinkage of clays coming from different parts of the same mine, also a difference in shrinkage of different strata. This shrinkage is caused by the variations of the physical and chemical nature of the clays. The amount of clay substance, quartz and impurities change, which might mean a large variation in the chemical analysis. In order to overcome this condition clays have to be selected in the mine itself. After it appears upon the surface it is again selected and placed in piles where a refractory and high grade clay is required. Where there is no special call for this, we simply use what is termed mine run, taken as it comes from the ground. Of course, this selection adds to the cost of the clay. There are other factors, such as weathering, grinding and soaking clays before they are put in the pan, and soaking after they leave the pan, all of which require work and added cost, but at the same time mean an improvement in the quality of the clay and should necessarily mean a higher price. Again, in the manufacture, there are manipulations through which a high grade clay has to go, adding to its cost, such as slow drying, which takes up quite a large surface of the floor, slow burning in the kilns, which means a less tonnage, and high heats at a greater expense for fuel, and care of the stock, all of which contribute to the cost as above stated. Where competition is met with, temptations to the manufacturer are to decrease his cost as well as his selling price. The costs are decreased, of course, by some change in the manipulations which might have a tendency to lower the grade of the product. This is set forth to give an idea of the care necessary when a conscientious manufacturer does his full duty to the customer. Of course, there are many conditions which cannot be gone into and which have their due effect on the refractory qualities. A clay for a gas bench should have a very high fluxing point, something like 3,100° or more. I have made numerous tests of the refractory points of clays and find that the best Cheltenham and Oak Hill clays have a refractory point of between 3,100 to 3,200°. This clay has a high reputation as a gas retort body. There are other clays throughout the State which have a higher refractory point, about 3,500°, but due to their excessive shrinkage they are not adapted to such use, being of a more aluminous nature. While the clays of St. Louis are highly silicious, a recognized condition necessary for retort and setting manufacture, some of the most noted clays of this country and Europe used for retort manufacture are of this kind. I believe there are one or two exceptions, but I personally do not know of good results obtainable by manufacturers using an aluminous clay for retorts. As stated above, the more manual labor expended on any clay, and the more you work them over, and the more care taken in the manufacture, the better the results, naturally with an increased cost. As to the actual manipulation necessary almost every individual manufacturer has his own secret process which, if applied to any clay but his, would not be successful, so different are the conditions which exist in clays. One factor in the successful production of a higher quality of goods is the length of time used in the manufacture while drying and burning, tending to improve the structure of the material, a thing which seems to be of small consideration in these days.

Should Mr. Baehr desire, I can let him see a paper I wrote in 1901 which covers the subject in a general way. Very truly yours,

[Signed.] LEMON PARKER.

A PAPER BEFORE THE NATIONAL BRICK MANUFACTURERS' ASSOCIATION, 1901.

Geologically considered, clays are the result or decomposition of the highly feldspathic rocks, such as gneisses and prophyries. These minerals are the silicates of alumina, with soda, lime and potash, which by the action of the elements slowly lost most of their alkaline constituents, some of the silica taking in water, and were converted into clays of varying range of use.

Where the clay is found near the place of its origin it is usually more impure, as it is found to be less free of the undecomposed quartz and mica, or even highly feldspathic in its construction; where clays have been worked over many times through geological eras and redeposited repeatedly, frequently quartz and mica are found to exist in perceptible proportions, together with evidence of the undecomposed feldspar.

Often there are differences in clays that chemical analyses do not make plain. The cause for variation in shrinkage of the same clay is one illustration; another is the apparent difference in the sandier nature, in the plasticity of different parts of the bed. Again, there is the seeming sandier nature of the clay. All this is based on the assumption that the analytical tests are found to run nearly alike, forcing us to look to another source for an explanation.

Supposing after burning the brick was found to be too friable. We know, or ought to know, that not only the plasticity, but any or all of the properties of clays, when worked up into brick or tile, are affected, not only by their chemical nature and by the mixture of different clays, but by a condition not usually recognized; that is, the mixtures of different minerals in the same clay, which might produce the same analysis in two clays of different physical properties.

Assuming this as true, how often and how many of us in experimenting for a mix to adapt a new clay to certain uses, after submitting samples to a chemist, are satisfied to try the various mixes in a hit-and-miss kind of way, contenting ourselves with the report that this or that mix failed, or was not refractory enough, or other vague inference, when an intelligent study of the failure might have led to a true interpretation of the result.

In making an investigation of this character, we may find a large per cent. of the clay contains quartz and feldspar, which might be determining factors in the success or failure of a trial mixture, which known might be corrected. While I am hardly prepared at present to form any definite opinion, I believe an analysis of this kind, while of no value to those engaged in the ordinary lines of medium firebrick, would be of great assistance to those engaged in furnishing material adapted to grades requiring a high vitrification, especially where the chemical nature of the fluxes is to be considered.

In experimenting with certain clays this phase of the problem has forced itself upon me as an important factor, although a proper basis for a systematic study of the question is not so plain.

We all know that the English and Germans in the old country, and some of those engaged in higher branches of ceramics in the United States, employ sure an analysis as an auxiliary to their chemical investigations, and I should like to hear from anyone who can enlighten us as to its utility in the selection and its value in making mixtures of clays, for specific purposes.

Chemically considered, fireclay is a combination of the hydrous silicate of alumina, associated mechanically with silica in various states of subdivision, but sufficiently free from the silicates of the alkalies, iron and lime and other fluxing impurities, to resist vitrification at extremely high temperatures.

Due to their chemical condition, clays vary in regard to their refractory character, not only in different sections of the country but in the same mine, by being interstratified with useless layers largely charged with oxide of iron. The relative proportion of silica and alumina is in itself no indication of its heat resisting quality, as both, whether in combination as silicates of alumina or as free silica, are essentially the refractory elements of the clay, being unvitrifiable, except when associated with detrimental impurities, but clays containing free silica are found to be somewhat fusible in the pressure of 3,024 per cent. of fluxing matter, while an aluminous clay could stand as much as 6 per cent.

or 7 per cent. of the oxide of iron without the loss of its refractory character.

Considered in relation to their use, the relative quantity of free silica seems to me to be very important. The fluxes being low and the grain, density and plasticity the same, there are conditions of use requiring a silicious brick, others requiring a brick approaching a more neutral state. or again a brick of basic nature.

Problems like this do not confront us all, but it is a matter of great moment to those who supply customers in the steel or other trade, who use certain processes requiring clays of high point of vitrification and free from possible material that might be attacked by the metallic slags, thus creating an agent that would destroy the brick. In the actual manufacture of material, generally speaking, the strides made in improved methods and machinery are immense.

In the memory of the present generation we have advanced from roller mills to dry pans. We have added wet pans, pug and auger mills, discarding the old chaser with its single roller. We have progressed from brickmaking in wooden boxes to iron molds and hand represses; we make end and side cut brick and repress by steam. Finally, we have reached the questionable stage of dry pressed firebrick, all systems having their votaries. With all this we still make our tile in wooden molds in the good, old-fashioned way.

The mad scramble for supremacy in the brick business, demanding reduction in costs and improved methods, is largely responsible for the changes, some of them of decided benefit, while other improvements have been altogether of a questionable character, affecting the quality of the production of certain manufacturers in a disastrous way.

I believe in the progressive spirit of the age, but caution should be exercised in adopting an untried process or new machine. Who will dispute the fact that an old-fashioned, hand made brick is not the superior of the steam repressed mud, or the dry pressed firebrick of to-day?

Actual tests under trying conditions have repeatedly proved this to be a fact, and so well is it understood that customers requiring unvitrifiable material have been known to avoid a manufacture whose inclinations run too much to mechanical aids. The question of drying is of special interest, and a number of methods are used for this purpose. I have noticed in my trips around the country that most of my Eastern friends use a temperature in their drying room that seems to the Western man an extreme, the cause being, I believe, due to the difference in the physical character of the two clays.

There are a number of systems in use having the merit of economy; one, tunnel drying from waste heat from kilns through steam fans, seems to have many supporters, and probably certain aluminous clays would act very well under these conditions, but would it not be greater economy to use heat in continuous kilns? Another, tunnel drying by waste steam, is, in my opinion, a better method, but still open to the objection of excessive temperature and forcing. Why not make the whole factory a drying room, using waste steam at a temperature that would not interfere with the men at work? This solution of the question is not only more in keeping with the traditions of the clay men, but it is actually the only safe method of drying when every factor contributing to the successful use of clay is to be considered.

The chemical changes in the burning of clay consist, first, in the destruction of the carbonaceous matter. The dehydration of the silicates of alumina destroys its plasticity. The decomposition of the disseminated carbonate of the protoxide of iron converts it into an anhydrous sesquioxide to which the yellow color is due, and the conversion of the sulphide to the proto-silicate which causes the black spots. The paleness of the color of the brick is not always due to the absence of iron, as a large proportion of carbonaceous matter would tend to bleach, by reducing the sesquioxide to a lower oxide.

Again, lime or other alkaline earths which are fluxing agents, might reduce the coloring power of a large percentage of the oxide of iron by forming a pale, double silicate of lime and iron. A properly burnt brick is uniform in color, and can only be obtained by slow burning.

A clay should be burnt in the kiln to a temperature nearly equal to that to which it is to be adapted. There are conditions which call for a brick burnt to a point where the fluxing matter is made to combine chemically with the refractory free elements in the clay increasing its power of resisting abrasion. This condition would be brought about by soaking the material in the heat for a long time.

The firebrick manufacturer of to-day is in an entirely different position from that of his brother in the past. Then his customers were few and very accessible, and his competitors his immediate neighbors, and the choice of refractory material a matter of local selection. His list of customers being limited the natural tendency was for each to cover the entire field afforded by the local market, making his production probably from one or two mixtures adapted to the use of his trade. Conditions to-day have entirely changed; not only is the whole market of the country open to some, but the conditions of use have completely changed, each branch of the trade demanding the best grade of material adapted to their use. These altered conditions were so gradual that almost imperceptibly the manufacturer has drifted into specialties, sometimes from choice, but as often from force of circumstances, as the adaptability of a certain product has become recognized on the market as a standard of excellence in a certain line or lines.

To-day brick of certain well known brands may be found in steel works whether located in the Eastern, Middle or Western States. Again clay goods of certain other characteristics obtain largely in gas works, whether located in Massachusetts or California, Canada or Texas, while middle and lower grades are still supplied from a local factory near the point of use. There is, it seems to me, much room for thought over the position of the manufacturer of medium brick in his relation to the market.

His quotations are largely used by some buyers in forcing the price of high grade goods down to the lowest limit, resulting frequently in the adoption of questionable methods of manufacture, not adapted to the requirements of the user, who probably imagines he has made a great bargain, only to find on trial the material lacking in some important particular for which the manufacturer is in his opinion solely to blame. Conditions like this enter largely into the calculations of the progressive consumer and the wideawake manufacturer, who recognize the value of the high standards rather than conditions of first cost.

In conclusion, I believe the manufacturer who studies his own interests will know the composition of clays physically and chemically, using this knowledge to increase their value, and will adopt only such methods of manufacture as are known by personal experience to be absolutely safe, in keeping his material up to the high standard.

Discussion by Mr. Stowe.

Mr. Parker has covered the ground so completely I hardly know what to say. The further one goes into the firebrick business, the less one seems to know. I started in the firebrick business in a small town in Ohio, about 20 years ago. Mr. Parker says it does not make much difference about the clays or percentage of silica. We are making firebrick with 85 per cent. silica. I believe that the fluxing materials that we have to contend with are the greatest difficulty in the manufacture of firebrick. It is a very easy thing to make a brick that will stand a heat of 3,000°, but the same heat in contact with lime will melt at 1,200° to 1,500°. Lime is the hardest thing to contend with in the manufacture of firebrick. We know brick that would stand 2,400° of heat but for the lime acting as a flux on the silica. Some years ago we were importing brick from Germany that sold for something like $200 per 1,000, but our manufacturers improved their product and to-day we are shipping brick to Germany, where 5 years ago they were shipping brick here. We are shipping brick as far as Australia for different purposes. I believe the firebrick industry is further behind with its work than any other branch. I think it is a good thing that the N. B. M. A. should take up the work it has. The iron and steel industry is the largest industry we have, and they are depending entirely on firebrick. It is an industry that we look at with more respect than anything else. It was at one time almost impossible to introduce a new firebrick in the market. Mr. Parker knows himself how it is, after a brick has made a certain reputation. The Mt. Savage brick has a reputation, and the Harbison & Walker has a reputation, and although a new man may make better brick he would have hard work to introduce his brick. Now, steel works are coming to a point where they will not think of running their plant without a chemist, and you can have your firebrick analyzed and so make it easier for the brick manufacturer to introduce his article. I visited Mr. Parker's plant last year, and although they have an entirelydifferent kind of clay for making brick, they make a brick that for certain work is better than any of the German brick. Germany used to supply the gas retorts of the country, now St. Louis supplies them. It is only a matter of development in this business that will make it one of the most important in the country. The question of the manipulation of clays is one that has to be looked after in the manufacture of firebrick to a greater extent than any other part of the business. We have to first look after the mechanical part of it, and then after the analytical. The little specks of iron that would not make any difference in the shape of paving or building brick which would make our brick run and give us a black eye. I think if the firebrick manufacturers would take more interest in the National Association and get together and study these things we would learn some-

thing. I attended a meeting about 2 years ago, at Pittsburg, of the firebrick manufacturers. There were present about 20 or 25 men interested in brick. Mr. Harbison was made president, and I was made Secretary, and we talked the matter over before the meeting. Every man thought he was in the right and every other man wrong, and I do not believe they have got together since. No other meeting was ever called, and so the "Firebrick Manufacturers' Association" that was to be, died abornin'.

Refractory Material for Gas Benches.

For some time past there seems to have been a tendency on the part of a large number of gas engineers to secure their bench material at very low figures, quality not seeming to have been taken into consideration. As a result the manufacturers who make a specialty of this class of work have found it necessary to make such changes in their methods as would enable them to make a slight profit.

In a number of cases the gas engineers have gone to nearby concerns which are not prepared to handle material of this nature and were able to secure their requirements at a very low cost. The result has been that the large manufacturers have been practically whipped into line and forced not only to reduce their prices but quality as well in order to keep on the right side of the ledger. It is a well-known fact that material used in bench settings as well as retorts should be made from mixes or batches which should receive ageing and treatment before working into blocks. This practice is followed by manufacturers in preparing blocks for glass furnaces and pots, and is the only way in which a high grade as well as satisfactory article can be secured. At the prices which the manufacturer receives at the present time for bench material as well as retorts, they cannot afford to age or treat their batches or mixes, merely taking them as one might say from the pug mills to the moulds. This means a greater shrinkage as well as the using of clays which have not formed an affinity for each other. Some people seem to think the treatment of clays is not necessary, but practices in the iron and glass business have demonstrated that it is an essential feature. Now, this means the storing of material for a given period, and in order to prevent drying out it means attention from time to time in the matter of turning, wetting down, and tempering of clays.

The great trouble in gas bench settings seems to be due to the shrinkage which takes place after the benches have been built. This in a way can be accounted for by improper calcining of burnt stock. A great many manufacturers recognize this fact, but owing to the low figure they are receiving for material and the knowledge that the "other fellow" is not doing this, forces them to deviate from the proper method, but at the same time they are compelled to do it.

In the matter of firebrick it is well known that a brick made from raw clay will shrink considerably, especially if the temperature attained in the gas bench is greater than the kiln in which the material is burnt. As a rule the benches are run higher than the ordinary brick kiln. The best brick are those made of a combination of raw and burnt clays, which means a more dense and compact brick as well as a brick that will have a minimum shrinkage. The low price feature again enters here. In a great many localities there are manufacturers who make brick from the raw clay, and as freight may be less than from a point where a well made brick can be obtained, it is either a case of the manufacturer who furnishes the higher grade of material to make a raw clay brick or else lose the sale of this material. He is then forced to either buy this cheap brick or allow the gas engineer to order the cheaper grade.

Should these raw clay or cheap brick, many of which are made from inferior clays, be used, the result will be that a certain part of the bench will give away, which means a settling of the upper part, *i.e.*, the settings and retorts. We all know that when a bench starts to settle the retorts have a tendency to crack, and when this happens it means the elimination of this retort, and this in turn a reduction of capacity in the bench which could undoubtedly have been avoided had the gas engineer specified a higher grade material. When one or two of the retorts out of a bench are shut down, it means that the cost of making gas increases considerably as the same amount of fire is used whether you are furnishing 7 or 9 retorts. And while this is the case there is also a large amount of coke, by-products and gas lost, owing to causes which, in most cases, can be traced to inferior clay material in some part of the bench.

All the manufacturer asks is a fair profit on his product, and when an engineer insists on certain prices he can rest assured that while he will get the material the quality will not be what it should.

A feature which has not been mentioned above is a selection of clays for this class of work. There are in all clay mines numerous grades of clay, and, unless price warrants it, it means that the run of mine, or, in a great many instances, clays that have been picked once are used for bench work, the higher grade having been selected for some other purpose.

When the gas engineer sees fit to specify certain clays, and is willing to pay a reasonable price for this material, the results obtained in gas plants in this country will be far greater than at present, and the expense of material will not be nearly so great as the benefits derived.

Respectfully submitted, R. H. Miller.

Memorandum.

Modern practice in all industrial branches calls for the greatest economy in the operation of their plants in order to meet the ever growing competition of other manufacturers. The first step toward this end is the selection of the proper apparatus adapted to the intended purpose. Nor must the first cost of an installation stand in the way of being chosen, if its efficiency is such as to offer decided advantages over other systems. The greatest production from a given amount of raw material, at the least cost and in the shortest space of time, is the aim pointed at. These considerations hold good under all circumstances and in all branches of whatever industry, but they are of especial moment in such plants where the product is of such character that, unless great precautions are taken, this product may become wasted by leaking or otherwise escaping. This is eminently the fact in the production of lighting gas. Apart from the fact that the raw material, in this case coal, must be treated so as to yield the fuel efficiency stored therein, the product itself must be guarded against waste to which it is easily subjected. The proper type of the bench being decided upon, same being well planned, the erection thereof must be most carefully executed. This applies to all parts of the structure, including recuperators, retort settings, retorts and inclosing walls. Among the various constructions in use the recuperative system is at this time regarded as the most efficient and being best adapted to meet the demand that can be made of an apparatus of this kind. Being gas fired, the room formerly taken up by the grates is available for the accommodation of additional retorts, thus increasing the output considerably without also increasing the expense for fuel. This, however, is only one advantage gained. The fact that the running of the fires is constantly under full control, that the temperatures can be raised to the degree that experience has found to be desirable, and that the heat can be so directed as to embrace all retorts alike, are of the greatest interest, insuring an almost perfect uniformity of the work both in operation and in output.

The retorts nowadays are manufactured from fireclay, all other parts of the construction, with the exception of the doors, being of the same material. The temperature may, therefore, be raised to the highest desirable degree, this being sufficiently high to attack and destroy any weak part of the construction, and great care must be taken for this reason to employ only such clays that are able to withstand the action of the flames or, in other words, are refractory. Bearing in mind that the retorts are opened from time to time to withdraw the coke and recharge with coal, it is easily seen that frequent and sudden changes in the temperature of these retorts must take place. The retorts must be able to withstand such changes without becoming injured, the life of a retort counting by years. They must also not wear off to any great extent during that time, nor must the clay from which they are made contain impurities making them liable to be affected by the coal in the course of distillation. It is also essential that the material be dense on account of the gaseous nature of the product which would find an easy way of escape. Of course, any existing pores in the retorts would soon be closed by the gasgraphite generated and deposited as a coating on the inner side of the vessels, but a certain loss would occur in the meantime. Every part of the apparatus must fit very closely and remain so, thus making it necessary that no shrinkage should occur after the bench is put up. This is especially essential in the settings of the retorts. The latter would be easily disturbed and endangered by any great disarrangement of their supports. The recuperator flues would not perform their work if through shrinkage any leak should occur. The air necessary for combustion could not be properly heated for the correct management of the fire, and in this manner a loss would be incurred by reason of the reduced percentage of distilled gases.

To sum up, the clay from which the materials are made which are used in the construction and operation of a gas producing plant must not alone be refractory, but also burn dense at a comparatively low temperature, and the ware must burn without losing its shape. Apart from the chemical analysis, which does not always agree with the obtained results, experience and care of the clay manufacturer are of the greatest importance, as he must select the material with a view to meeting all the difficulties mentioned above.

Christy, Mo., January, 1904. C. C. Hartung.

NOTES ON FIREBRICK TO BE USED IN THE CONSTRUCTION OF RECUPERATIVE GAS BENCHES.

In considering what kind of material should be used in the construction of recuperative gas benches, there are to be considered in special the following parts constituting a bench: (1), gas producer; (2), recuperator; (3), main body of bench, including retort settings; (4), retorts.

Gas Producers.—As it is common use in gas benches to operate each bench with a separate producer, this producer is directly connected with the bench. In such case it is most economical to work the producer as hot as possible. Therefore, even if as is usually done a water pan is arranged under the main producer (a certain amount of the water is then evaporated and in passing through the hot coke some water gas is formed, making a certain amount of heat latent, which becomes available again at the point where the main combustion takes place), the demands on the material forming the walls, etc., are great. In addition to the action of the heat, in the lower part of the produce from the grates up to as high as the bed of coke reaches, the action of the ashes under the influence of the heat is to be taken into consideration. In order to overcome this, only good, very dense firebrick with smooth faces and of, as it is usually though not quite exactly termed, basic character; that means, that its analysis should show a large percentage of A 12.03 should be employed. For the upper part, any good dense firebrick, which will stand the heat without shrinking and melting off, will do.

Recuperator.—The recuperator has to act once as a means to convey the combustion gases to the stack and the secondary air (for combustion) to the point at which the combustion takes place; and second, as a means to transmit the heat yet stored in the combustion gases to the air for combustion. The influence of heat on the brick or tile constituting the network of the recuperator is not great, as readily will be seen. The air enters with a temperature equal to that of the atmosphere and reaches its point of destination (if the recuperator is designed right) with a temperature of 950° F. The combustion gases will leave the main bench to enter the recuperator with about 1,000° F. and leave the recuperator with about 450° F. The conditions in the recuperator always being the same on each place, no change in temperature taking place, the recuperator brick and tile will only have to answer the following requirements:

1. They shall be absolutely straight and true, without cracks, and of a character that insures easy cutting, in order to allow an absolutely tight and workmanlike construction. All shrinkage shall have been taken out of them in burning.

2. They shall be of a dense, smooth and hard burnt makeup, to allow as perfect transmission of heat as may be obtained with fireclay material.

Main Body of Bench, Including Settings.—Where the air is leaving the recuperator it meets with the gas, forming perfect combustion, which usually will take place with about 2,500° and 2,600° F. It will be readily seen that the material used in these places (burners) should be very refractory. As it is true that the denser a refractory material is made up the more resisting it is under equal conditions, otherwise these burners should show this quality and should be burnt very hard. The same would apply to all the settings for the retorts, as the average temperature in the main bench, if economical conditions prevail, will be about 2,200° F. As to the setting blocks, they must be made up just to fit the retorts and should be absolutely true, so as to allow convenient setting without too much of time wasting, cutting and grinding. They should be burned at higher temperature than is exacted on them in the bench, so that no shrinkage can occur while they are performing their duty, thus endangering instead of bearing the retorts.

The walls surrounding the main bench should also be highly refractory and dense, smooth firebrick. For the main arch, thrown over the bench, there should be used arch brick made up of highly refractory fireclay, grogged with burnt fireclay as usual, under an addition of a sufficient amount of quartz, which will insure a non-shrinkable material, but be kept in such limits as not to make it grow more than to allow tight closing of joints.

Retorts.—The retorts form the most important and at the same time the most expensive part of the gas bench. It is, therefore, well worth while to consider exactly what requirements they have to fulfill, and that the best on the market is just good enough, and as in so many other cases the cheapest. A retort that is well made up and of the proper material and composition will pay its cost by its longevity, which by-the-way should be about 1 year, and by economical operation. The requirements of a good gas retort are:

1. That it be made up of a good fire-resisting material, which does not shrink nor grow any more at the temperatures from 2,200° to 2,500° F., about, prevailing in the main bench.

2. That the material show the highest degree of indifference against frequent and extensive changes of temperature; that is, a tenacity usually not peculiar to clay ware.

3. That the body of the retort show a great resistibility against mechanical attacks, which occur every time the retort is drawn and loaded, and especially when the retort graphite is being removed.

4. That the inner surface be absolutely smooth to facilitate the removal of the graphite.

The clay or clays used for the retorts shall, of course, be absolutely free from the iron pyrites or lime pebbles (as most of the retorts and settings in stock at the Indianapolis gas works, August, 1902, showed in a very bad way).

Some fine, hair-like cracks can hardly be avoided and fill up very soon with graphite. They may even act favorably as to better resistibility against sudden change in temperature. This, of course, shall not speak in favor of the extensive network of wide cracks to be seen in the greater part of the retorts on the market, which merely suggest that the preparation of the material used and the makeup are not at all up to the requirements. It may be mentioned yet that in some places the retorts are glazed or enameled inside. But this helps only for the first short time to facilitate the removal of the graphite, and besides tends to make the retorts sensible against changes in temperature. GEO. C. F. VATER.

Christy, Mo., January, 1904.

January 11, 1904.

W. A. Baehr, Esq., Engineer, Laclede Gas Light Co., City: Dear Sir: Your esteemed favor of the 6th was duly received, but absence from the city a few days has prevented prompt reply. I fully appreciate the remarks made, and think that our class of material has been sold under such strong competition that prices have been cut below what the best material ought to bring. Of course, when prices are so low it will affect the quality of the goods. We can all make a better grade of material whenever the gas companies are willing to pay a better price. This is true in all lines of manufacture where quality counts. Your field of investigation as outlined in our letter is a pretty broad one, and I do not see how I can give you any special information that would be of much value in your paper. But I am willing to assist you in any manner that I can with any information that might be of use, and will try to call on you in a few days and personally talk over the matter. However, it seems to me that the proper correction of this state of affairs is in the hands of the gas companies. If they are willing to pay better prices, they can without doubt also get a higher quality of material, especially in the way of brick, furnace blocks and settings. Of course, every factory has its special grades, and the best grade of one company may be better than the best grade of another company, as one manufacturer may have better knowledge of the right process for making the best material. After you get what the manufacturer considers his best material, it is only then by a crucial test that you can determine what has the most merit and is the most suitable for your requirements.

These questions do not apply to the quality of our retorts, as we make but one quality of retorts, and aim to make them of the highest possible grade for durability. We permit nothing in the way of expense to interfere with the quality of our retorts. No matter what price they are sold at, we do not allow the selling price in any manner to interfere with the making of the retorts.

If there is anything in this letter that you care to use, you are perfectly welcome to do so. Hoping to see you personally in a few days, I am, yours very truly, JOHN DELL, President.

January 20, 1904.

W. A. Baehr, Engineer, Laclede Gas Light Co., City: Dear Sir: Replying to yours of the 6th, I have tried to give you in the following an outline of the clays as used by this Company in the manufacture of material for gas benches.

The refractory materials used in the construction of gas benches are usually fireclays (impure, hydrated silicates of alumina). The impurities generally found consist of oxides of iron, lime, magnesia, alkalies, etc.

Clays are rarely used singly or in their raw state, but require admixture, one with the other, as well as mechanical treatment, to adapt them to the requirements of the brick, tile or retorts, as the case may be. Raw, untempered clays when used alone invariably contract and crack when exposed to high temperature, and the expansion and contraction encountered in gas benches, thereby causing fissures and settlements, quickly destroy the efficiency of the bench.

Clays are refractory in proportion to their basic character—that is, to the amount of alumina they contain; and are less useful as they become silicious (acid) in their character; whilst the presence of ferrous oxide to the extent of 2 per cent. or 3 per cent. renders most fireclays useless for high temperature work. Alkalies, when present to the extent of from 1 per cent. to 2 per cent., render fireclays fusible at high temperatures. Lime and magnesia when in but small quantities make most fireclays comparatively fusible. Owing to the facility with which lime and silica combine to form a fusible silicate, it is necessary to avoid using clay containing lime in any furnace where it may be exposed to a white heat.

The value of fireclays depends largely on their freedom from calcic carbonate, iron pyrites and ferrous oxide. Any of these at high temperatures will combine with the free silica of the clays to form fusible silicates. The presence of 3 per cent. or 4 per cent. of the foreign oxides in silicious clays will render them fusible, but if the clay be aluminous, then on account of the fusibility of most aluminates, even 6 per cent. or 7 per cent. of ferrous oxide does not destroy its refractory quality. The presence of oxide of iron has a strong fluxing effect and 2 per cent. or upwards affects the fusibility of clay.

The following analysis will show the character of the fireclays used by the St. Louis manufacturers:

Cheltenham fireclay:	
Silica	61.22
Alumina	25.64
Oxide of iron	1.70
Lime	.70
Magnesia	.08
Alkalies	1.31
Manganous oxide	.45
Water and loss	9.68
Flint clay used in settings and retorts for grog:	
Silica	42.19
Alumina	44.12
Oxide of iron	.78
Lime	.18
Magnesia	.12
Alkalies	.19
Loss and water	12.42

Firebrick, tiles and retorts, as manufactured by the Laclede Firebrick

Mfg. Co., from the above clays and their mixtures, are of various grades and structure, suited to the different conditions encountered in furnaces and distinct parts of furnaces. The mechanical arrangements of the particles in brick, tile or retorts materially affect their power to resist heat and also the expansion and contraction occurring in gas benches. Generally, the coarser the particles the better the material will stand. It has been the practice of manufacturers in the past to use the same material in all parts of benches, excepting in the retorts where a higher grade of material has been used in some instances. This, we have learned from experience, will not do. We have found that the generator arches require a high grade material for the reason that many times, through carelessness or ignorance, sufficient coke is not kept in the generator or there is a leak in the charging door. This causes combustion of CO_2 to take place in the generator and the result is the melting of the arch tile and nostril hole blocks, and the letting down of the settings and the retorts. We have found it necessary to make all the material composing the combustion chamber and also all of the settings of high grade material. This we find greatly prolongs the life of the bench.

When a bench starts to settle or let down and the retorts become cracked or out of shape, the fault is nearly always in the settings about the combustion chamber where the greatest heat is encountered. We have yet to find a case where the retorts have been melted down. We do find them cracked and ready to fall to pieces, but in most cases it is from abuse where they have been exposed to undue expansion and contraction, by a constant change of heats or by leaving them with the mouthpieces open for long intervals. I have seen men in retort houses throw water into retorts when drawing them. There is no fireclay material made that will stand such treatment.

Too much importance cannot be given to the drying out of the benches after their erection. Rushing new benches is very often the cause of their never giving satisfaction. It causes all manner of troubles in the bench, especially leaks in the recuperator tile.

Another thing which I believe to be the cause of much trouble in many works and the early letting down of the benches, is the ignorance of many retort house foremen as to the operation of the air slides on the recuperative benches. They do not seem to realize the effects the movement of $\frac{1}{4}$ of an inch or even less will have on the benches. This cannot be too strongly impressed upon them, as it is the cause in nearly all cases of the inefficiency of the bench.

I am taking the liberty of sending you samples of the materials used by our Company in the different parts of the bench. Sample "A" is unburned retort clay; you will notice the mixture of the plastic and flint clays; "B" is material used in settings, combustion chamber and in generator arch; "C" is material used in generator walls, and "D" material used in recuperator tile and arch tile.

I hope this will cover the information you asked for, and I sincerely hope you will find time to visit our factory, as I am sure you would be able, by a personal visit, to get a better idea of the process of manufacture than I could possibly give you in this way. Yours very truly,

LACLEDE FIREBRICK MFG. CO., J. L. GREEN, Vice-President.

P.S.—You will find among samples, one marked E. This is made entirely from flint clay of abcve analysis. This material is used only for furnaces carrying the highest heats such as open hearth steel furnaces, etc.

(To be Continued.)

[Concluded from Page 650.]

A Review of the Last Report of the Massachusetts Board of Gas and Electric Light Commissioners.

The foregoing figures show a healthy condition of the business in Massachusetts, and the average price ($1.06) per 1,000 cubic feet is not high considering the fact that all material used in the manufacture of gas has to be carried 500 or 600 miles. In the face of this disadvantage we expect to see the price still further reduced and the business increased in future years. Reliable statistics in regard to use of gas stoves are hard to get, particularly where no fuel rate is in force, and the figures given in the report are stated to be estimates in many cases. Boston appears to have in use about 50,000 stoves, leased from the Gas Companies; this is in addition to those owned by the consumers. Fall River has 13,994 stoves, or 1 to every 7.5 of the population in 1900; Lowell has 7,000, or 1 to 13.5; Springfield has 10,938, or 1 to 5.7; Worcester 7,250, or 1 to 16.3; and Haverhill 5,072, or 1 to 7.3. Boston being the largest city of the State, it would be of interest to give some comparisons of the figures relating to the gas business there, but the "swapping of jack knives" in the sale of gas, backwards and forwards, between the several Companies, makes the task almost impossible for anyone, except perhaps the Gas Commissioners themselves. The result of this practice is that the haze which surrounds the financial operations of the Companies also envelops their manufacturing accounts. In 1903, the Bay State Company sold gas to 5 other companies; the Brookline Company sold to 3; the Dedham to 1; the East Boston to 1; the Massachusetts Pipe Line to 9; the Roxbury to 1, and the Waltham to 1.

We thought that at the time the Bay State Company was in control matters were about as complicated as they well could be, but the present condition makes confusion worse confounded. A Company, entitled the Boston Consolidated Gas Company, was authorized by the Legislature, on June 10, 1903, for the purpose of consolidating the Boston, Brookline, Bay State, Roxbury, South Boston, Dorchester and Jamaica Plain Gas Companies and the Massachusetts Pipe Line Company.

This new Company is affiliated with "The Massachusetts Gas Companies." which is an unincorporated Company or voluntary association, formed in September, 1902, with a capital of 25 millions of 4 per cent. preferred stock and 25 millions of common stock.

It owns practically all the stocks of the Brookline, Dorchester and Jamaica Plain Gas Companies, as well as those of the Addicks' combination, which it purchased on the foreclosure of the Boston United Gas bonds, but this latter transaction is now in litigation. It also owns the stocks of the Massachusetts Pipe Line Company and the New England Gas and Coke Company, as well as a mortgage for 8 million dollars on the latter property.

This hybrid Association was probably organized in the manner above described, so as to avoid running foul of the Massachusetts Act of 1894, prohibiting foreign "corporations" from issuing stock on the securities of domestic corporations, and which this Association does actually, if not technically.

The Boston Consolidated Gas Company has applied to the Commissioners for permission to issue stock for the purpose of paying for the stocks of the Companies it proposes to consolidate, and from the remarks in last year's report, we judge the Commissioners will offer no objection to this, but the amount authorized will probably be a disappointment to the incorporators of the new Company.

Nearly 3,000 million feet of water gas is manufactured in the State; but outside of Boston, none of the larger cities make water gas exclusively except Fall River and Haverhill. With a legal standard of only 16-candle power, the policy of making any water gas in Massachusetts, would appear to be doubtful.

The item of depreciation in the accounts of the gas and electric companies seems to be omitted in many cases, but for what reason does not appear. Five per cent. is the legal rate for depreciation on electric plants, but we do not recall that any rate was ever made for the gas companies or what property should be included in it, as being subject to depreciation. All of the municipal plants appear to include an item for depreciation in their accounts.

In addition to the electric companies heretofore enumerated, there are 12 small privately owned plants furnishing light to the public, which are under the supervision of the Commissioners.

The gross receipts of all the electric companies, including the electric receipts of those gas companies which run electric plants, were $6,642,000 in 1902, and $7,206,000 in 1903. The expenditures were $4,110,000 in 1902, and $4,639,000 in 1903, and profits of $2,532,000 and $2,567,000—the exact increase in profits being $34,705 in 1903.

After deducting the profits of those plants which are run by the gas companies (which are included in the gas companies' dividends) the operations of the remaining electric plants, after paying all capital charges, interest, dividends apd depreciation, show a deficit of $270,000 in 1902 and of $100,000 in 1903. Several of the items leading to this result show great variations, and require more explanation to account for them than is given in the report.

The principal of these items are the following:

	1902.	1903.
Income from rents, jobbing, etc...	$420,838	$85,743
Interest paid.....	347,031	371,423
Dividends.....	1,207,458	1,225,480
Depreciation.....	262,086	221,852
Sundry items	1,016,897	508,835

Seven of the corporations did not earn expenses and 30 did not earn enough to warrant the payment of any dividend. Judging by the aggregate deficit in 1903, some of the companies must have been paying dividends that were not earned. In 1902, five companies did not earn expenses, and 25 others paid no dividends.

Excluding the electric businesses run by the gas companies, the electric business run by the electric companies shows a decrease in gross profits of $901. We do not know whether it would be a fair deduction from these figures, to say that the gas companies can run the electric business to better advantage than the electric companies themselves, but the gas companies made an increase of $35,607 in gross profits on their small business, while the electric companies suffered a decrease of $901. The balance sheet of the electric companies shows assets in 1902 of $25,233,000, and $29,484,000 in 1903. The construction account increased from $22,866,000, in 1902, to $24,937,000 in 1903. All the other items of assets except material are for cash on hand, investments, notes, bills, and accounts receivable. The material account increased from $603,000 in 1902 to $691,000 in 1903.

The net surplus was $935,000 in 1902, and $977,000 in 1903, and ad-

ding the reserve funds, shows an actual surplus of $1,965,000 and $2,258,000 for the respective years.

In the general balance sheets of both the gas and electric departments, the amount of "notes payable," which exceeds 5 million dollars in each case, seems larger than the necessities of the business should require, and "other items," which aggregate over 5 million dollars, do not convey much information to an outsider.

Fifteen of the companies showed a deficit, against 10 in 1902. Total taxes amounted to $410,000. Dividends and interest were paid by the gas and electric companies as follows:

Electric.	1902.	1903.
Interest	$347,000	$371,000
Dividends	1,207,000	1,225,000
Gas.		
Interest	438,000	488,000
Dividends	1,364,000	1,350,000

A very large amount of notes receivable—$2,286,000—appears in the assets for 1903. This is almost entirely due to the Edison Company, of Boston. That Company has over 1,200 miles of wire in underground conduits, but both the named Company and all others will finally have to face a great expense in burying a much greater proportion of their wire than is now in subways.

Prices in Boston for 2,000-candle power arcs for all-night street lighting vary from 33 to 35 cents per night, or, say, $125 per year, average. In Haverhill the price is $125; in Lawrence, $90; in Lowell, $121; in Lynn, $105.85; and in Worcester, $109.50. Prices vary so greatly for commercial electric lighting that it is impossible to make even an approximate average price from the schedules published.

We think that the value of the reports would be very greatly increased if the Commissioners could see their way to publishing the total yearly station output in kw. hours of each of the companies, divided into arc, incandescent and power circuits, where practicable, and also the average price per kw. for each kind of current. The highest dividend paid was 18 per cent., by the Worcester Electric Light Company, which paid only 8 per cent. in 1902. The Edison Company, of Boston, came next with 10 per cent., which was also paid by the small company at Gardner.

The lowest gross meter rates are 10 cents per kw. hour, by the Niles Estate (Boston) and 11 cents at Lowell. The highest is 50 cents at Gardner. Most of the gross meter rates are subject to tempting discounts, to attain which, however, the consumer must sit up all night, and ruin himself with an exorbitant electric light bill.

Several of the companies have shown a spirit of insubordination when directed to comply with the reasonable and legitimate orders of the Commissioners, and it appears to us that their authority might be increased with advantage in dealing with these cases, and also with those previously noted.

In 1901 the Massachusetts Pipe Line Company declined, on technical grounds, to furnish reports of its operations, as required by law, but subsequently gave up this contention. No reference is made in the report to the suit which we presume is still pending between the Commissioners and the Haverhill Gas Securities Company, regarding its refusal to comply with the order of the Commission to reduce the price of gas to 80 cents. This order should have gone into effect the 1st of February, 1900, but the Company refused and still refuses to obey it, and has commenced a suit to compel the Commissioners to rescind their order, and in the meantime the price remains at $1.

Much valuable work has been done by the Commission since its establishment, but mostly of a negative or preventative character, in restraining the illegal operations of individuals and companies in their efforts to increase the price of gas or the capitalization of the companies.

These operations were frequently abetted by some of the sharpest lawyers of the State, and with the, at times, almost irresistible influence of the "Third House," it was impossible, in every case, to circumvent them. The Commission also has at times had a political coloring, but we believe it has never been strong enough to affect the impartiality of its decisions, though probably none but the Commissioners themselves know the extent of the pressure brought to bear on them to secure their influence. Their best piece of work was probably the cancellation, in 1893, of the $4,500,000 note of the Bay State Gas Company, and its steadfast refusal to permit the Brookline Company to fund its floating debt, which is not represented by actual value, is very creditable. The attitude of the Commission and State is also liberal towards those companies which have been purchased by the municipalities in which they operated, and the price realized by the Holyoke Company, at its recent sale, cannot be considered inadequate. The aggregate salaries of the Commissioners amount to $11,000 per year, and their influence, if it could have been bought, was worth many times this amount to the promoters of the various schemes, that have been attempted during the life of the Commission, but we think it will be admitted by all that the conduct of the Commission is a complete refutation of the belief of that large party which holds that honest supervision of this kind is impossible in the United States.

We do not believe that this country is to be wrecked by dishonesty, but, on the contrary, we are optimistic enough to think that the honest men are still in the great majority; that our ideals of to-day may become the realities of to-morrow; that the names of those millionaire schemers, and of their pettifogging jackals, which are now a stench in the nostrils of Massachusetts, will finally be swept from the pages of gas history, and that the concluding lines of Longfellow's "Building of the Ship" still represent the feelings and aspirations of most Americans, and are not empty vaporings nor maudlin sentimentality.

The expression of these sentiments is hardly pertinent to an investigation of the gas statistics of Massachusetts, and our apologies are, therefore, due to those Americans, "for revenue only," to whom this digression may seem irrelevant. The operation of the Commission has been so generally beneficial to the true interests of the gas business that it has been a matter of surprise to us that similar Commissions have not been established in other States.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, April 11th, 1904.

Natural Gas in England.—Prof. Lewes on Some Properties of Gas.—Some New Purifier Devices.—Gas is Not Unwholesome.

The evidence submitted before the Royal Commissioners on Coal Supply includes the testimony of many well known names in the gas industry. The object of the inquiry is to define the extent and the durability of the coal supply, and it is evident, from the prominent position given to one especial subject, that the Commission find that the question of gaseous fuel is intimately mixed up with that of coal consumption: and, further, that the existing gas companies have already taken up an important position as distributers of fuel. Amongst the enormous number of subjects dealt with were one or two that will be especially interesting to American readers.

The present position of natural gas was set forth by Mr. R. Pearson, Managing Director of the Natural Gas Fields of England Company. The operations of this concern have not yet attained to the proportions one might expect from the title, being in fact confined to Heathfield, in Sussex, and the immediate locality. At present the Company have 9 wells at Heathfield and are sinking 10 others. They have also put down, or have in progress, about half a dozen bore holes at places 5 to 15 miles distant, and they are contemplating laying large mains to Brighton and Eastbourne. The gas comes from a porous strata below a bed of sandstone, and which is about 100 feet thick, and the existence of a second strata at a lower depth is expected. At Mayfield, 5 miles from Heathfield, they have put down two borings in the Hastings sand. One yields gas, and the other, at the depth of 300 feet, gave petroleum and would readily yield a barrel or two per day. Their borings cost 12s. to 13s. a foot, and they could put down 300 to 400 feet deep in a month. The area at present exploited is about 200 square miles. The "natural gas fields of England" have been in existence for some years, and they move rather slowly, for, with the exception of the small experiment at the village ef Heathfield, it does not appear that they are selling any of the natural product. So far, therefore, they have not exerted any appreciable influence as regards economizing coal consumption.

The evidence of the gas experts was to a great extent merely a repetition of views they have already expressed before Parliamentary Committees, at meetings of companies, or at lectures before learned societies. In speaking of the incandescent mantle, Prof. Vivian B. Lewes gave expression to views that are scarcely in accordance with those generally accepted. According to this authority users of the Welsbach burner need only consider one factor, that of price. He is in favor of a 12-candle gas, and says that, with a reduction in photometrical quality, there is not at all a corresponding reduction in the light emitted by the mantle, and that the light is not almost entirely dependent upon calorific value. Very often a mantle would give a worse result with an enriched coal gas of fairly high calorific value than with a poor 12-candle gas, and even with blue water gas results are obtained that are nearly as good. The best result he had obtained from water gas was a duty of 19 candles per cubic foot. The calorific value of water gas was 320 units and that of 16-candle coal gas 640 units per

cubic foot, and blue water gas would cost 5d. in the holder as against 13d. for coal gas. From this it would appear that so far as incandescent light is concerned calorimetric experiments are a superfluity.

On another point the Professor enunciated some remarkable views, and that was in connection with the loss of candle power during distribution, which he set down as one candle for 5 miles. The loss was very small in new pipes, but in time they became coated with tarry matter which absorbed benzene from the gas. Something turned upon the size of the pipes. For example, in the large pipes that brought gas from Beckton to London—a distance of 10 miles—the loss was not more than half a candle. Enriched gas would lose 2 candles or more in traversing 5 miles of pipes. The Professor's experiences seem to have run upon imperfectly condensed gas, and it is satisfactory to know that as long as the pipes remain free from tarry matter on the inside there is no appreciable loss. In many if not in most districts this is the condition of the pipes. I have taken up pipes laid 50 years ago and the rust shaken out of them was perfectly dry. A loss of anything like 0.5-candle on 5 miles run would mean a very inconvenient quantity of fluid hydrocarbons to be taken from the drip boxes, and special arrangements for its periodical removal and collection.

Prof. Lewes said that the liquid taken from the drip boxes was so volatile that he had never been able to get a satisfactory sample of it, but the taking of samples of volatile liquids is a simple matter. In places where there is really a loss anything approaching that above indicated, some attention to the quantity and quality of liquid deposit would be very desirable. Since the loss would be represented by the liquids deposited in the mains an examination of this nature would be the most satisfactory method of arriving at the extent of loss in traveling.

Whatever the characteristics of a gas for distribution may be, it must be fairly permanent under ordinary climatic variations, and that for reasons far more extensive than the mere loss of value to the customer. A gas that deposits freely gives rise to all sorts of troubles. The "coating of tarry matter" does not increase the area of the pipe, nor does it assist the durability of the diaphragm of the dry meter. It will not act as a satisfactory lubricant of tap plugs, swivels and other moving parts, and will also give rise to trouble in the small apertures connected with atmospheric burners. If a gas loses during rapid transit through a large main what may be expected to occur during a comparatively slow journey through 50 feet or so of ⅜-inch pipe, which constitutes the last trip for the bulk of the gas. Such pipes would certainly require cleaning every year or two. In fact it may be taken for granted that in their own interests—and public companies are never credited with ability to appreciate other considerations—they will take care to supply a practically permanent gas that will not deposit liquid hydrocarbons to any important extent.

German gas engineers have been directing attention to improvements on the grid system of supporting purifying material in the purifier, with the result that two new plans are competing for public favor. There is the Jäger system and the Standard system, both of which claim to render the thickness of the material an immaterial matter, and amongst other advantages to increase the capacity of existing boxes 100 per cent. This is interesting to those whose increased make has overtaken and outstripped the purifier capacity and who have obdurate directors or other difficulties in the way of capital outlay for larger boxes, as either plan can be adapted to existing plant.

The efficiency of a purifier is dependent chiefly upon the quantity of material and next upon the velocity of the gas through it. Any system that really gives an advantage should therefore get more material into the same size box. For example, a vessel 6 feet deep and 20 feet square will, under ordinary working, be charged with two tiers each 2 feet 3 inches thick, or say 75 per cent. of the whole. Out of 2,400 cubic feet we have 1,800 cubic feet of material. So even if the vessel was filled from bottom to top we could not get more than 33 per cent. increase in bulk. In order to account for the much larger saving claimed we must consider the application of sub-division. The current may be divided into two or more equal parts each of which passes through similar fraction of oxide. Returning to the above example a very simple way would be to admit the foul gas into the space between the two tiers and to have an outlet at the bottom as well as the top. Instead of the whole of the gas traversing the whole of the oxide we have it travelling half the oxide. The effect of halving the gas is to halve the velocity, and the question is whether passage through 2 feet 3 inches thickness of oxide, at a velocity equal 1, is a more effectual method of purification than traversing the whole of the material at a velocity equal 2. But beyond that it is difficult to see where the advantage of division comes in. If we divide up the vessel into n division and send $\frac{1}{n}$ part of the gas through each we reduce the porportion of oxide traversed. If a journey through 12 inches thickness of oxide is sufficient for proper purification where is the advantage of sending it through 10 or 12 feet? But the 12-inch will evidently want more careful watching and more frequent renewal. With the Standard arrangement the gas travels up or down as in the usual plan. But with the Jäger system it travels horizontally. There is a flat distributing chamber filling up one side having narrow slots extending the whole depth, and from these slots dividing screens extend the whole length of the purifier. The arrangement on the other or outlet side is similar, and the dividing screens break joint with the inlet, the space between being occupied by oxide. The result is that the material is arranged in vertical layers extending the whole depth of the box and in number twice that of the inlet slots. The gas is divided into $2n$ parts (n being the number of inlet slots) and passes through $\frac{1}{2n}$ part of the bulk of material, but at a proportionately reduced velocity.

The successful application of the dry faced cover in place of the water lute has enabled considerable economy in the construction and in the arrangements for changing the vessels. The ponderous Goliath for lifting the covers is displaced by a light set of blocks and falls running on an overhead rolled joist. Four boxes can be joined in one block, saving 25 per cent. of the side plates and economizing space. There are several devices for simplifying and economizing valves and connections, of which may be mentioned Ramsden & Smith's, Pickering's, Milbourne's. The dispensing with connections does away with the necessity—always more sentimental than real—for placing the boxes on the first floor. They can be buried so as to bring the top at about ground level, resulting in a saving as regards structural cost and also in working. These alterations, together with those mentioned in the preceding paragraph, may be expected to revolutionize the appearance of our purifying houses.

The *Lancet*, one of our leading medical journals, publishes a somewhat trenchant article on gas and electric lighting under the title of "The Gas Bill and Health," in the course of which it stated that, with proper methods of burning, the vitiating effect on the air is practically a negligible quantity. Most gas engineers are already well aware of this, but as determined efforts have been made by parties interested in other systems to create a scare on this point and to lead people who valued their health (who does not?) to discontinue the use of gas, it is satisfactory to have this independent testimony. Electric light, it is stated, is much more expensive than gas and it cannot be so easily controlled. Strange to say, the writer blames the gas companies for improper use of gas on the part of consumers, and more than insinuates that they rather encourage it. He does not appear to be aware of the fact that there is scarcely a gas company in the Kingdom that has not incurred considerable expense in one way or another, by way of lectures, demonstrations, showrooms, attention to complaint, etc., etc., all for the purpose of instructing the gas consumer. That the great difficulty is, not the unwillingness of the gas company to teach, but the indifference, not to say objection, of the consumer to be taught. He very often treats the well meant advice as simply an artful dodge for making the meter work faster, in which respect he is supported to some extent by the views expressed in the *Lancet*.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. F. H. CORSON has been appointed foreman of works of the New London (Conn.) Gas and Electric Company.

"J.W.B." is informed that the title of the New Castle (Del.) Gas Company has been changed to that of the New Castle Gas Light Company.

A CORRESPONDENT in Decatur, Ills., writing under date of 24th inst., says: "Of all the attractions at the St. Louis World's Fair none should interest gas men as the exhibits of the manufacturers who display goods used in their line. Some of these exhibits are planned upon an elaborate scale, showing thousands of articles and illustrating their uses by practical demonstration. A fair illustration of the scope of some of the larger exhibits is that of the H. Mueller Manufacturing Company, of Decatur, Ills. This firm shows over 3,000 samples, and although most of the pieces are small in size, a freight car of largest capacity was required to transport them from the Company's warehouse to the Fair. The Mueller exhibit is located on E street, between 4th and 5th streets, Palace of Manufactures, and its booth is one of the most attractive in that building. In the center and at the rear is a pyramid 18 feet tall,

and having a base 20 by 15 feet. Most of the articles of the exhibit are displayed upon this pyramid, which is arranged in a series of shelves and faced with black velvet and plate glass mirrors. Surmounting the pyramid is the key feature of the exhibit, a pressure regulator of mammoth dimensions, designed for regulating the pressure of water in large street mains, or in pipes leading from reservoirs to city mains. This huge casting is seven feet tall and weighs several tons. On the shelves of the pyramid are pressure regulators of smaller design; lead branch connections for connecting house pipes with street mains; over 20 patterns of corporation cocks; 300 different patterns of gas service, meter and stove cocks; over 150 patterns of stop, and stop and waste cocks for controlling water in service pipes; over 250 designs of compression and fuller bibbs for use at water outlets into bath tubs, lavatories, sinks, etc., and various designs of plumbers', gasworks and water works tools. In the foreground is an exhibit of various water and gas appliances in actual operation. Pipes supplied with water at high pressure are used to demonstrate the working principles of water main tapping machines and pressure regulators. With the tapping machine holes are drilled into the pipe and a corporation cock for making a connection with a smaller pipe is inserted into the hole, the operation being performed without the escape of water. Pipes under air pressure are used to demonstrate the feasibility of making a tap in a gas main with a gas main tapping machine without the escape of gas. The operating principle of water pressure regulators is demonstrated by attaching a regulator to a small pipe and setting a pressure gauge on either side of it to show the initial high pressure at the inlet and reduced pressure after the water has passed through the valve. In addition to the working exhibit of the tapping machines and pressure regulators, all of the other products in the general display are shown in sectional parts, and the smaller cocks, bibbs, etc., are attached to pipes and shown in operation.

MR. A. B. EILBECK has been appointed Manager of the Akron (O.) Gas Company.

MESSRS. E. K. DUNBAR & CO., 159 Devonshire street, Boston, Mass., are offering $25,000 in bonds, issued for the completion of the new plant of the Peoples Lighting, Heating and Power Company, of Barre, Vt.

A CORRESPONDENT in Cincinnati, writing under date of the 23d inst., incloses the following: "The meeting of the Directors of the Cincinnati Gas and Electric Company, held the 21st inst., was one of the most important held for several months. The question of increasing the dividend on the stock was discussed from all points. A report was read from a Committee, composed of Messrs. Charles P. Taft and R. A. Holden, appointed to make a thorough investigation of the physical condition of the gas plant, and also to determine whether the earnings of the Company would justify an increase of ½ per cent. per annum in the dividend. The report stated that there were many misleading statements regarding the physical needs of the Company's plant; that it would not be necessary, in the Committee's opinion, to increase the capacity of the gas plants until the year 1906, even at the present rapid increase of gas consumption; that it absolutely would not be necessary to make a further increase in the stock. As regards the dividend, the earnings of the Company, the increase made during the past 12 months and what it expected in the future were reviewed, and in the opinion of the Committee the Directors would be justified in increasing the dividend, for with the increase the Company will have on the 1st of next January, after paying all expenses, fixed charges and dividends, a surplus for the 12 months of $100,000. Casimir L. Werk, the capitalist, was elected a Director to fill the vacancy caused by the death of W. A. Goodman. President Norman G. Kenan suggested that it would be advisable to make the selection at this time. President Kenan made two appointments yesterday. Edward J. Sherwood, who has been the Superintendent of the Gas and Electric Light Company, of Lincoln, Neb., has been selected as Assistant Superintendent of the West End plant. Herman Russell, who has been Superintendent of the San Francisco gas plant, will be Assistant Superintendent at the East End gas works. Mr. Russell was also in charge of the gas plant at Manistee, Mich. The Company was never in better shape, and its growth, in so far as its gas division is concerned, is simply wonderful."

MESSRS. WILLIAM MAINLAND, of Oshkosh, Wis., and Sinclair Mainland, of Green Bay, Wis., have purchased a controlling interest in the Marquette (Mich.) Gas Light Company.

THE proprietors of the Benton Harbor, St. Joseph (Mich) Gas Company have cut the selling rate to $1.25 per 1,000 cubic feet. This means a concession of 10 cents.

AT the annual meeting of the shareholders in the Rochester (N. Y.) Gas and Electric Company, which was set for noon of the 21st ult., the chief action taken was the following, according to a statement issued by Mr. Albert H. Harris, the attorney for the Company: "At the meeting of the Rochester Gas and Electric Company stockholders this morning an adjournment was taken for two weeks, no election being had of directors or officers. The present board will continue until the adjournment. It was stated at the meeting that negotiations were in progress looking towards a combination which would result in uniting the control of the Rochester Gas and Electric Company, Rochester Light and Power Company, and Rochester Railway Company. An expert examination of the plants has been made, but the reports giving the result of such examination have not yet been received, nor have all the details of the plan been formulated for submission to the stockholders. It is hoped that at the time of the adjourned meeting matters will have progressed so far as to make it possible to submit the proposition fully, but now no statement in that regard can properly be made because alterations in the plan are still possible."

THE Derby (Conn.) Gas Company has certified to an increase in its capital stock of $100,000; from $300,000 to $400,000.

THE Springfield (Mass.) Gas Light Company has petitioned the authorities for the right to supply gas in the outlying village of Agawam.

AT the annual meeting of the United Gas Improvement Company, which will be held in Philadelphia to-day, John F. Dryden, President of the Prudential Insurance Company, of Newark, N. J., will be chosen a Director, vice the late William L. Elkins.

MR. WALTER GREACEN, JR., has been appointed Superintendent of the gas and electric divisions of the Public Service Corporation properties in Hoboken, N. J.

THE Morristown (N. J.) Gas Light Company has again petitioned the authorities of Morristown for the right to supply gas in that borough.

MR. HENRY T. HOYT, for many years President of the Danbury and Bethel (Conn.) Gas and Electric Light Company, died at his home in Danbury, the night of the 15th ult. Deceased was in his 73d year, having been born in Danbury, March 22d, 1832.

The following from San Francisco, Cal., under date of April 19th, explains itself:

"A great peace has come over the directorate of the San Francisco Gas and Electric Company. Witness the following letter, which is being delivered to-day to the various shareholders:

"'To the Shareholders of the San Francisco Gas and Electric Company: Referring to our letter of March 7, touching the composition of the Board of Directors to be elected April 26, we take pleasure in advising you that differences have been adjusted. In this communication Mr. C. O. G. Miller joins. It is, therefore, from the entire directory of the San Francisco Gas and Electric Company. At the meeting to be held on April 26, it is proposed to amend the articles of incorporation and increase the number of directors from 11 to 13. The meeting will then be adjourned to convene on the following day, for the purpose of holding the election of a Board of Directors. We now recommend the election of the following Board of Directors: W. B. Bourn, Homer S. King, A. H. Payson, Edward J. McCutchen, C. Osgood Hooker, C. O. G. Miller, Antoine Borel, Louis Monteagle, W. J. Dutton, Daniel T. Murphy, I. W. Hellman, Robert Watt. Mr. J. Downey Harvey, on account of absence from the State, desires to retire from the board, leaving one vacancy to be filled at the annual meeting. We trust Mr. Harvey will consent to serve. Mr. Robert Watt will be appointed to fill the vacancy existing in the Executive Committee. All shareholders who have not already given their proxies are requested to send them to the Secretary of the Company. Yours respectfully, W. B. Bourn, C. Osgood Hooker, C. O. G. Miller, Edward McCutchen, D. T. Murphy, A. H. Payson, Homer S. King (by Frank B. King), William J. Dutton (by J. B. Levison), Isaias W. Hellman, Louis F. Monteagle.' This means that there will be no battle on the annual meeting on April 26, and that W. B. Bourn will be re-elected President. Robert Watt, a supporter of C. O. G. Miller, is to join him on the board, and it is said, will be made a member of the Executive Committee. The letter of March 7, referred to in the foregoing communication, informed shareholders that Mr. Miller's criticisms had caused a decline in the value of the shares of the Company. Miller denied the charge, but that is all ancient history now, for Miller and Bourn have buried the hatchet."

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NOTIFICATION RESPECTING ADVERTISING.
Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:
New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, MAY 2, 1904.

The Market for Gas Securities.

The market for Consolidated gas was steady and strong during the week, the closing to-day (Friday) being 209 to 209¼. The Remsen bill is now in the hands of Governor Odell, and the public hearing thereon, which was to have been held in Albany yesterday, has been postponed for a week. Well informed people believe that he will let the measure become a law. In the face of Mayor McClellan's action it is hard to see how the Governor can do otherwise.

The feature of the week was the sharp rise in Brooklyn Union, which sold above 223 to-day, and closed at 221 to 223. Intrinsic merit is sufficient reason for the advance. The annual meeting of the Standard Gas Light Company, of New York, will be held the 14th inst., and that of the New York Mutual on the 10th inst. The Cincinnati Gas and Electric Company has increased its dividend rate to 4½ per cent. per annum, and the stock scored quite an advance in consequence. Washington (D. C.) gas is 290 bid, and Peoples, of Chicago, is firmer, at 97 to 97½.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

MAY 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	209	209¼
Central Union, Bonds, 5's	3,000,000	1,000	104	106
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan	658,000	..	108	112
Mutual	3,500,000	100	300	290
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	105½	106
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	31	..
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	..	..
Northern Union, Bonds, 5's	1,250,000	1,000	102⅛	105⅛
New York and East River.. Bonds 1st 5's	3,500,000	1,000	109⅛	111
" 1st Con. 5's	1,500,000	..	106	108
Standard	5,000,000	100	125	13
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299.650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	221	223
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	¼	⅝
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	4	4⅝
" " Bonds, 5's	5,250,000	1,000	61	68
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	100⅛	101
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101⅛
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¾	89¼
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	100	102
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	71	72
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	86	90
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99⅛	100
Detroit Gas Co., 5's	352,000	1,000	75	75¼
" Inc. 5's	16,000	100	98¼	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	85	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104⅛	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	59⅛	61
" Bonds, 5's	10,500,000	..	103	104½
Indianapolis	2,000,000	..	62	72
" Bonds, 6's	2,650,000	..	103½	106½
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	90	100
Preferred	2,500,000	100	80	90
Bonds	10,000,000	1,000	109⅛	110
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	135	140
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	107½	108¼
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	184¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105½
New Haven	1,000,000	25	64	70
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	97	97⅛
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	.
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	58⅛	58¾
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	92	96½
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	113½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	46	48
Bonds	2,047,000	1,000	94	96
Washington, D. C	2,600,000	20	283¾	292½
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600.000	50	230	..

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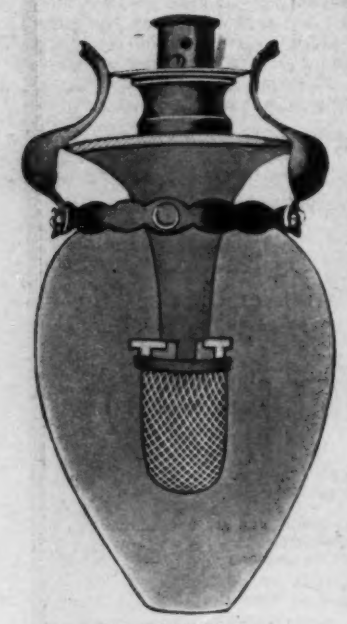

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May be consulted with reference to estimates of cost for new, or appraising actual value of existing works; utility of proposed or patented processes; relative earning power to capitalization, and management. Will NOT undertake to furnish apparatus or material, or to contract for the erection of works.

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THE PURIFIED GAS REVIVES THE FOULED OXIDE.

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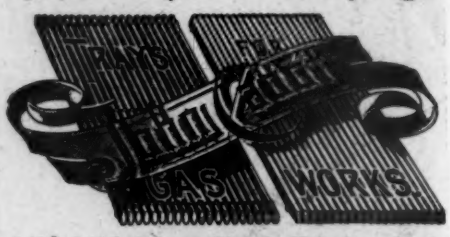

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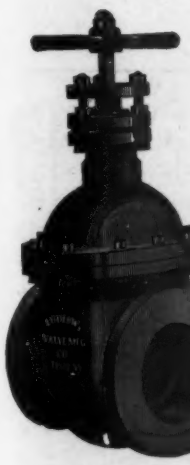

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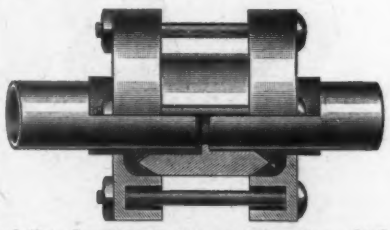
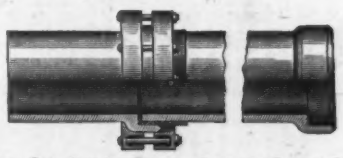
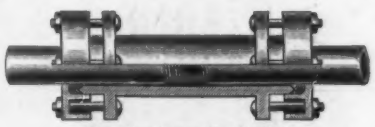


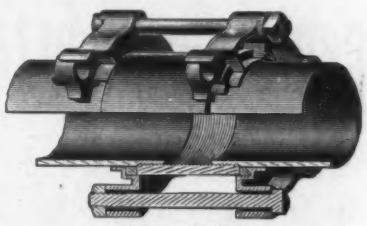
Insulating Coupling for Wrought Iron Pipe. Style 5.



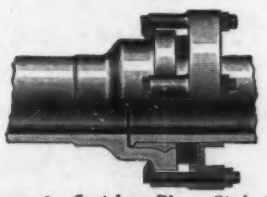
Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.



Regular Sleeve. Style 2.



Clamp. Style 4.



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Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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Economize Heat in Water Gas Plants,

BY UTILIZING A

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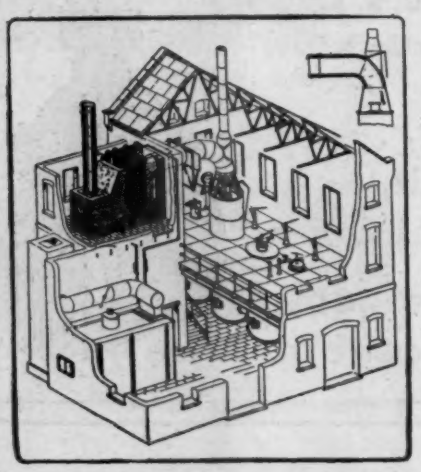

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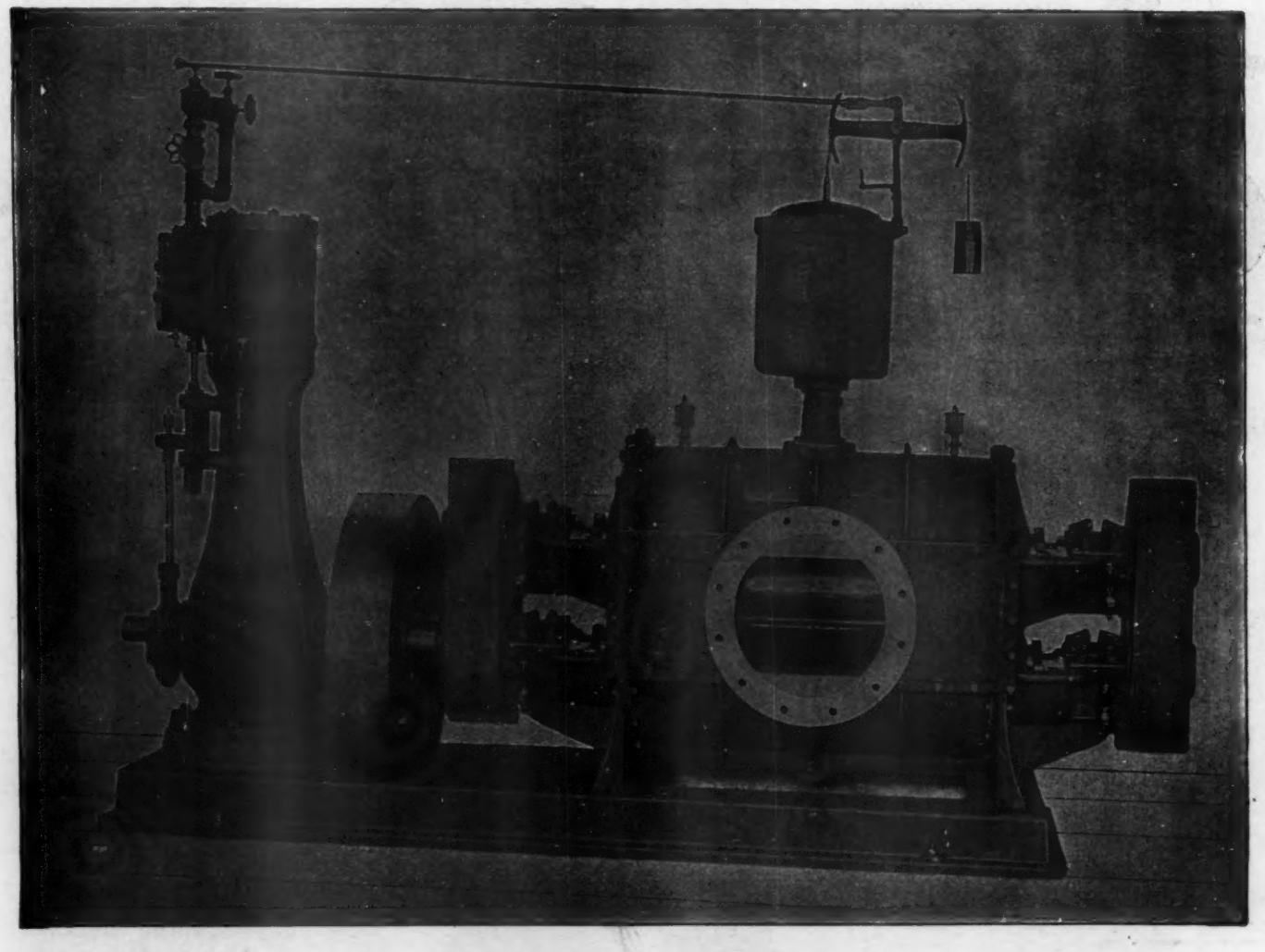
Always in the lead. Always anticipating the requirements of the trade. Our new Exhauster meets all demands of modern gas making and overcomes all difficulties heretofore experienced.

OUR GAS GOVERNOR IS MAKING FRIENDS EVERY DAY.



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WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

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Valuation of Gas, Electricity and Water Works

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Any size gas main can be shut off in 30 seconds. : : :

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No. 2, Price, $35.

With our experience, ability and facilities we produce

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Simple construction.
Perfect workmanship.
Highest efficiency.
Prices surprisingly low.

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Four Roll Troughing Idler
FOR WIDE BELTS.
The positions of the rolls conform to a natural and uniform curve of the belt.

BELT CONVEYORS

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BALL BEARING ROLLS

Possess greater efficiency, consume less power, and the belts last much longer than when any other type of roll is employed.

Permit us to tell you why and to submit plans and estimates.

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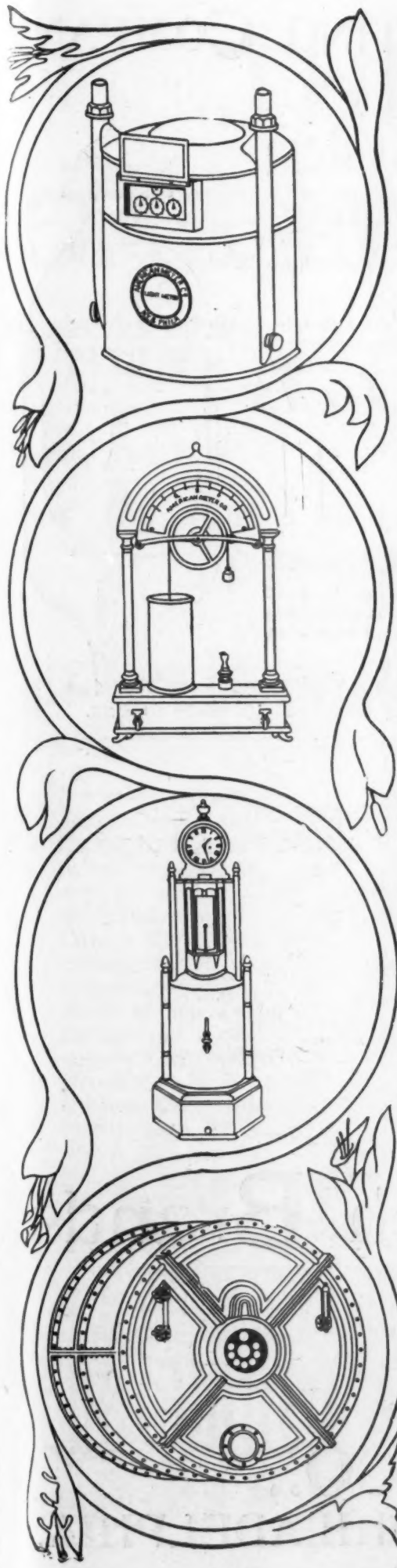
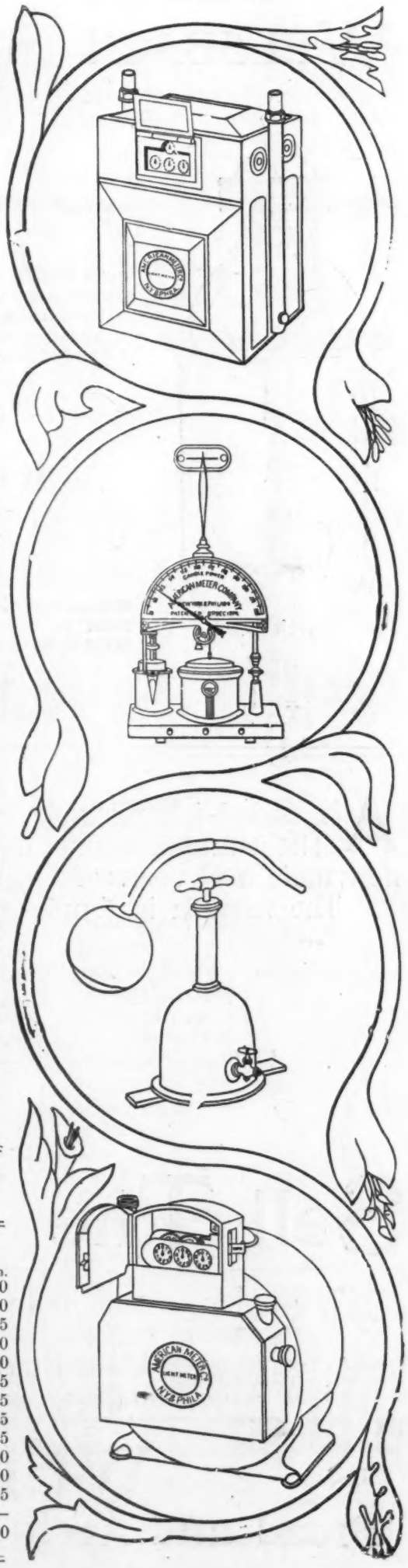




PUBLIC LIGHTING TABLE.

MAY, 1904.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Sun.	1	7.30 PM	9.50 PM	6.45	4.00
Mon.	2	7.30	10.50	6.45	4.00
Tue.	3	7.30	11.40	6.45	4.00
Wed.	4	7.30	12.30 AM	6.45	4.00
Thu.	5	7.30	1.10	6.45	4.00
Fri.	6	7.30	1.50	6.45	4.00
Sat.	7	7.30 LQ	2.20	6.55	3.40
Sun.	8	7.30	2.50	6.55	3.40
Mon.	9	7.30	3.20	6.55	3.40
Tue.	10	7.30	3.50	6.55	3.40
Wed.	11	7.30	3.50	6.55	3.40
Thu.	12	7.30	3.50	6.55	3.40
Fri.	13	7.30	3.50	6.55	3.40
Sat.	14	7.30 NM	3.50	7.00	3.30
Sun.	15	7.40	3.40	7.00	3.30
Mon.	16	7.40	3.40	7.00	3.30
Tue.	17	7.40	3.40	7.00	3.30
Wed.	18	7.40	3.40	7.00	3.30
Thu.	19	10.10	3.40	7.00	3.30
Fri	20	10.50	3.40	7.00	3.30
Sat.	21	11.30 FQ	3.40	7.10	3.15
Sun	22	12.10 AM	3.40	7.10	3.15
Mon.	23	12.50	3.40	7.10	3.15
Tue.	24	1.20	3.40	7.10	3.15
Wed.	25	2.00	3.40	7.10	3.15
Thu.	26	2.40	3.40	7.10	3.15
Fri.	27	No L.	No L.	7 10	3.15
Sat.	28	No L. FM	No L.	7.15	3.15
Sun.	29	No L.	No L.	7.15	3.15
Mon.	30	7.50 PM	9.30 PM	7.15	3.15
Tue.	31	7.50	10 20	7.15	3.15

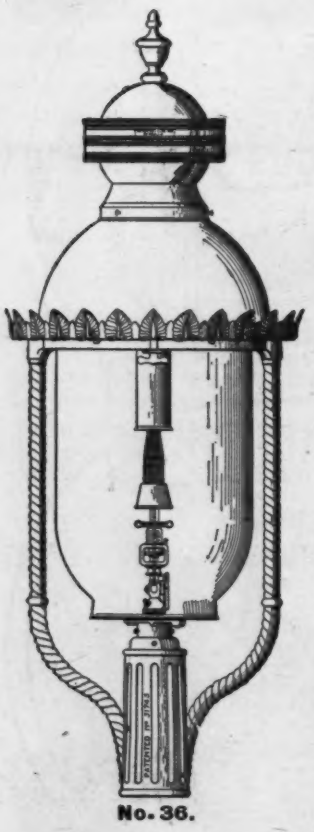
TOTAL HOURS LIGHTING DURING 1904.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	225.00	January	423.20
February	205.40	February	367.40
March	187.40	March	355.35
April	169.50	April	298.50
May	152.30	May	264.50
June	137.20	June	234.25
July	138.50	July	243.45
August	151.00	August	280.25
September	164.40	September	321.15
October	191.30	October	374.30
November	210.30	November	401.40
December	237.10	December	433.45
Total, yr.	2171.40	Total, yr.	4000.00

NEW YORK, 97 Liberty Street.
BOSTON, 814 Beacon Building.
PHILADELPHIA, Broad and Arch Streets.
ST. LOUIS, 712 Roe Building.
CHICAGO, Foot of Orleans Street.
SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

AN underlying principle in business is to show an increase each year---to grow. The astute dealer not only seeks to retain this year's customers, but to attract new trade next year.

The formula is simple-

THIS SHIELD IS THE WELSBACH TRADE MARK.

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Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

The genuine Welsbachs---Burners or Mantles---make satisfied customers---keep customers---MAKE NEW ONES.

And your profit isn't merely dollars and cents.

WELSBACH CO.,

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THE UNITED GAS IMPROVEMENT COMPANY

For the Year Ending December 31, 1903. has been Awarded Contracts in the Following Places for

Standard Double-Superheater Lowe Water Gas Apparatus.

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Baltimore, Md.	Lynn, Mass.	New York (Central Union Co.)
Chicago, Ills.	Newark, N. J.	Cicero, Ills.
Amesbury, Mass.	Washington, D. C.	Chicago (Ogden Co.)
Aberdeen, S. D.	Boone, Ia.	Easton, Pa.
Winsted, Conn.	Pueblo, Col.	Lawrence, Mass.
Canon City, Col.	Charlotte, N. C.	Council Bluffs, Ia.
Schenectady, N. Y.	Fall River, Mass.	Chattanooga, Tenn.
Hagerstown, Md.	Duluth, Minn.	Tuckerton, N. J.
Malden, Mass.	New York (Mutual Co.)	Springfield, O.
Bridgeport, Conn.	Waltham, Mass.	Easton, Pa. (2d contract).
Albert Lea, Minn.	Dover, Del.	Mobile, Ala.
Brooklyn, N. Y.	York, Pa.	Conshohocken, Pa.
Kansas City, Kas.	Minneapolis, Minn.	Mason City, Ia.
Hempstead, N. Y.	Allentown, Pa.	

TOTAL SETS FOR 1903, ... 62
TOTAL DAILY CAPACITY, ... 62,950,000 cubic feet.
TOTAL SETS TO DATE, ... 508
TOTAL DAILY CAPACITY, ... 362,780,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
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FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

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Fire Brick Manufg. Co.,

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
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Water Gas Cupola Linings, Fire Clay, Etc.

Proprietors for the U. S., Coze System of Inclined Benches.

Estimates Furnished on Application for Most Successful Style of Construction.

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

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Established 1845. Reorganized 1902.

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Manufacturers of the very best quality of Clay Retorts, Blocks, Tiles, Settings and Firebrick of every description.

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NEWEST DESIGN FOR

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AND

Independent Retort Settings.

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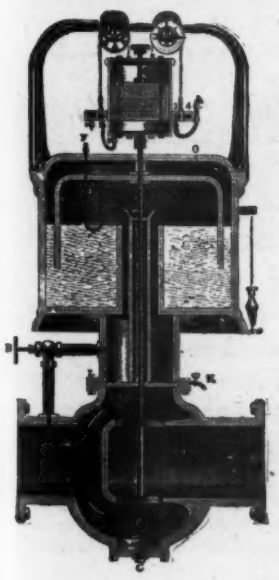

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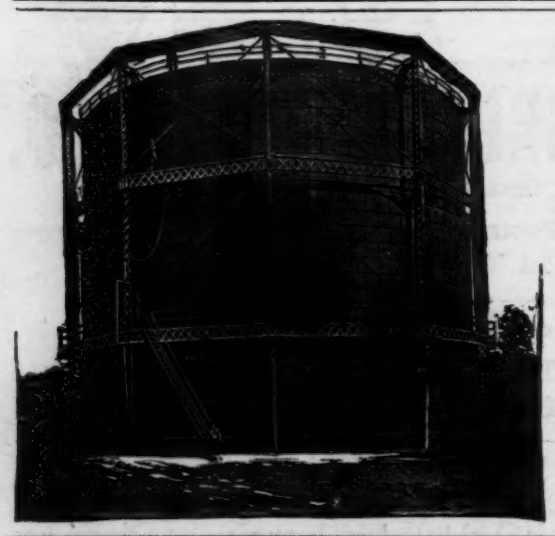

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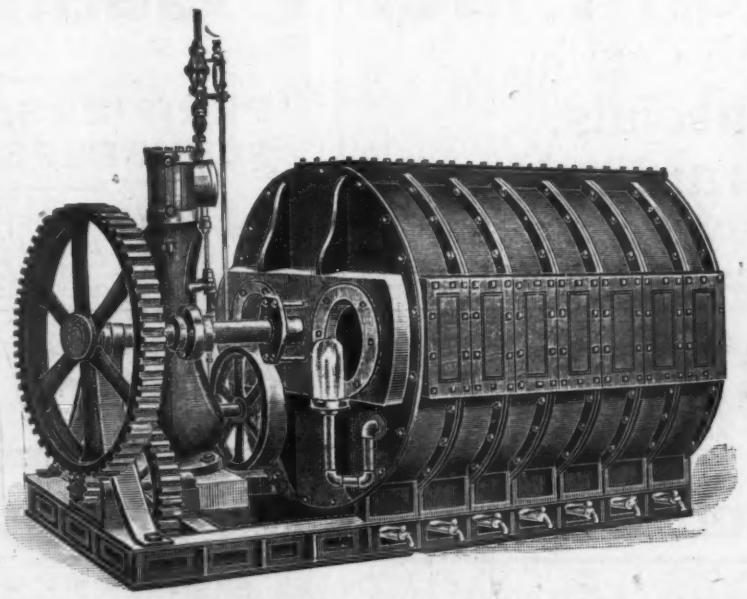

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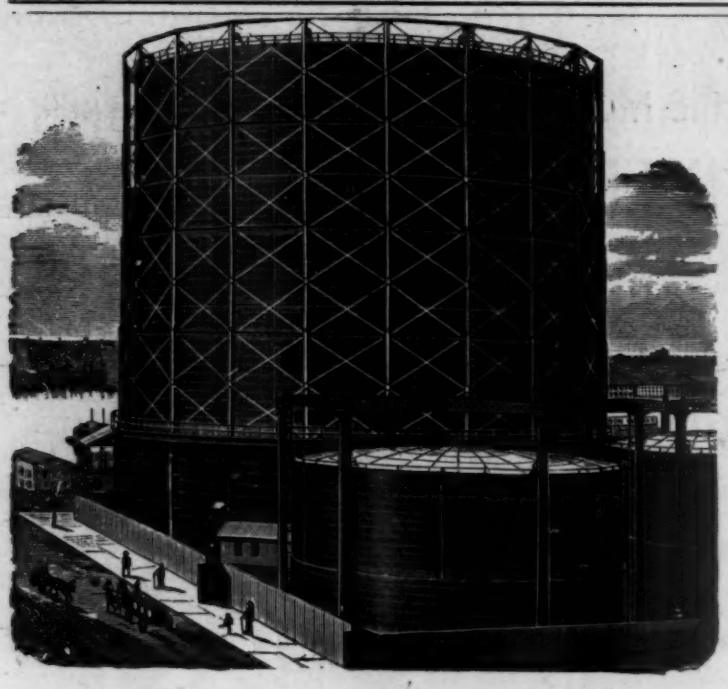

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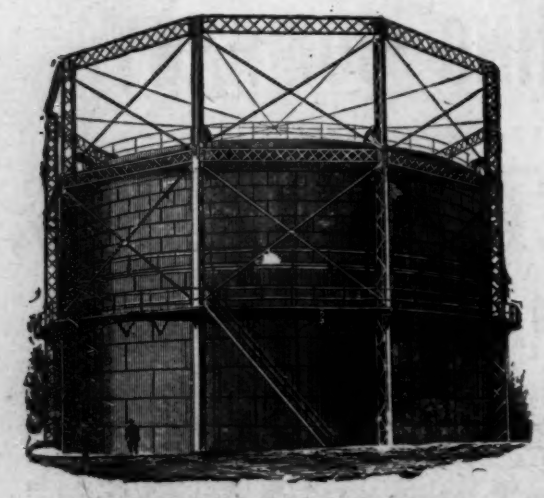

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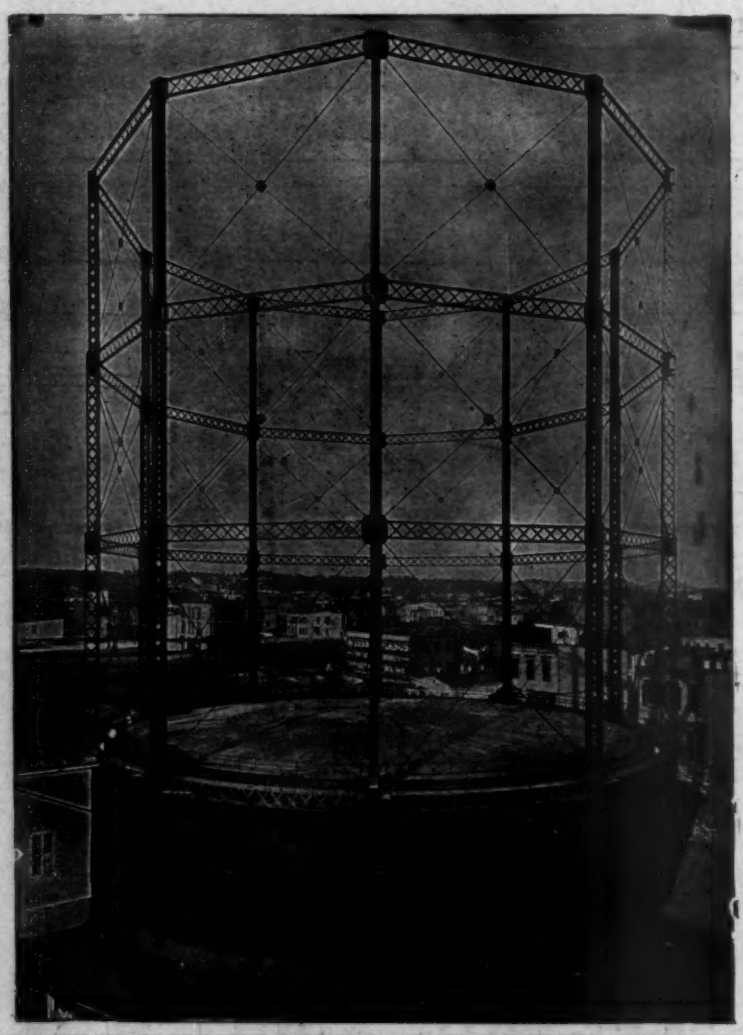

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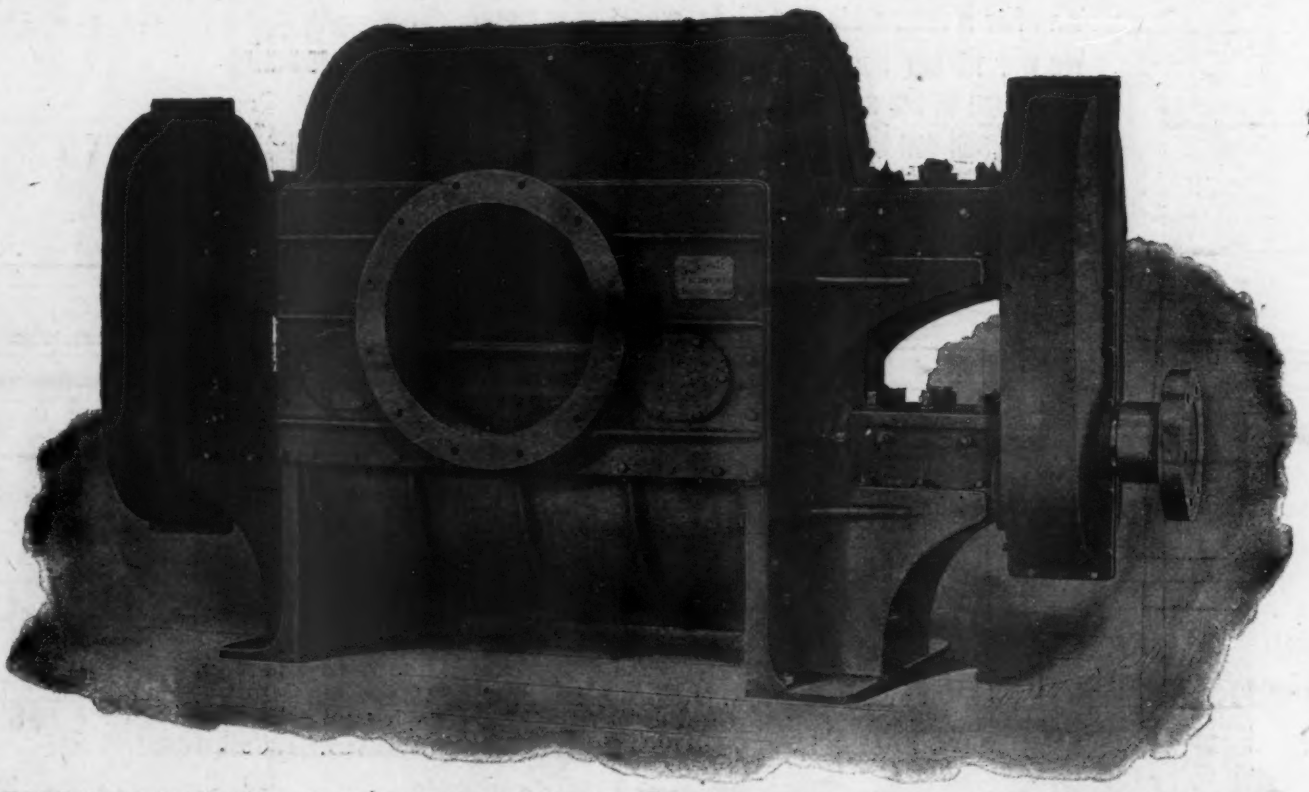

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